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I. Product

This manual offers a brief introduction of the installation connection for F2000-P series inverters, parameters setting and operations, and should therefore be properly kept. Please contact manufacturer or dealer in case of any malfunction during application.

1.1 Nameplate

Taking for instance the F2000-P series 7.5KW inverter with three-phase 400V input, its nameplate is illustrated as Fig 1-1.

3Ph: three-phase input 400V, 50/60Hz: input voltage range and rated frequency.

3Ph: 3-phase output; 17A, 7.5KW: rated output current and power;

0.00～60.0Hz: output frequency range.

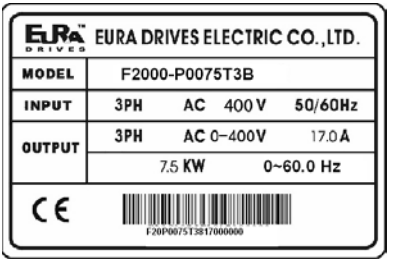


Fig 1-1 Nameplate Illustration

1.2 Model Illustration

Taking the same instance of 7.5KW inverter with three-phase, its model illustration is shown as Fig 1-2.

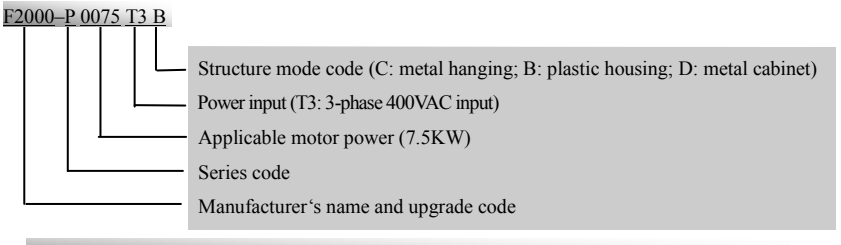

F2000–P 0075 T3 B
Structure mode code (C: metal hanging; B: plastic housing; D: metal cabinet)
Power input (T3: 3-phase 400VAC input)
Applicable motor power (7.5KW)
Series code
Manufacturer's name and upgrade code

Fig 1-2 Product Model Illustration

1.3 Appearance

The external structure of F2000-P series inverter is classified into plastic and metal housings. Only wall hanging type is available for plastic housing while wall hanging type and cabinet type for metal housing. Good poly-carbon materials are adopted through die-stamping for plastic housing with nice form, good strength and toughness.

Taking F2000-P0015T3B for instance, the external appearance and structure are shown as in Fig 1-3. Process of low sheen and silk screen printing are adopted on the

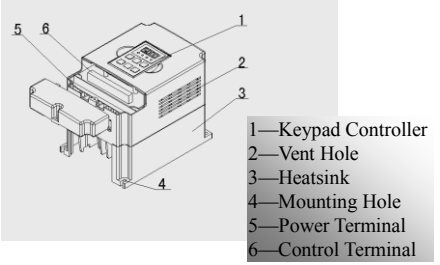
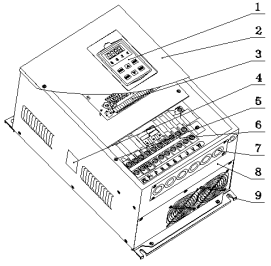


Fig 1-3 Appearance of Plastic Housing

housing surface with soft and pleasant gloss. Meanwhile, metal housing uses advanced exterior plastic- spraying and powder-spraying process on the surface with elegant color. Taking F2000-P0220T3C for instance, its appearance and structure are shown as in Fig 1-4, with detachable one-side door hinge structure adopted for front cover, convenient for wiring and maintenance.



1-Keypad Control Unit
2-Front Panel
3-Control Terminal
4-Nameplate
5-Mounting Screw
6-Power terminal
7-Outlet Hole
8-Body
9-Mouting Holes

1.4 Technical Specifications

Table1-1 **Technical Specifications for F2000-P Series Inverters**

	Items	Contents
Input	Rated Voltage Range	3-phase 400V±15%;
	Rated Frequency	50/60Hz
Output	Rated Voltage Range	3-phase 0～400V
	Frequency Range	0.00～60.0Hz
Control Mode	Carrier Frequency	1600~10000Hz; random carrier frequency
	Input Frequency Resolution	Digital setting: 0.01Hz, analog setting: max frequency× 0.1%
	Control Mode	VVVF control
	Overload Capacity	120% rated current, 60 seconds, 150% rated current, 10 seconds.
	Torque Elevating	Auto Torque elevating, Manual Torque Promotion 0.1%~30.0% (V/F)
	V/F Curve	3 kinds of modes: beeline type, square type and under-defined V/F curve.
	DC Braking	DC braking frequency: 1.0~5.0 Hz, braking time: 0.0~10.0s
	Built-in PID	Easy to realize a system for closed-loop process control
	Automatic Voltage Rectification (AVR)	Enable to keep output voltage constant automatically in the case of fluctuation of grid voltage.
Operation Function	Frequency Setting	Potentiometer or external analog signal (0～5V, 0～10V, 0～20mA); keypad (terminal)▲ / ▼ keys, PC/PLC setting.
	Start/Stop Control	Terminal control, keypad control or Modbus control.
	Running Command Channels	3 kinds of channels from keypad panel, control terminal and Modbus communication port.
	Frequency Source	Frequency sources: given digit, given analog voltage, given analog current and given Modbus.
	Accessorial frequency Source	Flexible implementation of 4 kinds of accessorial frequency fine adjustments and frequency compound.

Protection Function	Input out-phase, input under-voltage, DC over-voltage, over-current, inverter over-load, motor over-load, over-heat, external disturbance	
Display	LED nixie tube showing present output frequency, present time, present PN voltage, present PID feedback value, present PID setting value, present output current, present output voltage, types of faults, and parameters for the system and operation; LED indicators showing the current working status of inverter.	
Environment Conditions	Equipment Location	In an indoor location, Prevent exposure from direct sunlight, Free from dust, tangy caustic gases, flammable gases, steam or the salt-contented, etc.
	Environment Temperature	-10℃～+50℃
	Environment Humidity	Below 90% (no water-bead coagulation)
	Vibration Strength	Below 0.5g (acceleration)
	Height above sea level	1000m or below
Protection level	IP20	
Applicable Motor	0.75～710KW	

1.5 Designed Standards for Implementation

- IEC/EN 61800-5-1: 2003 Adjustable speed electrical power drive systems safety requirements.
- IEC/EN 61800-3: 2004 Adjustable speed electrical power drive systems-Part 3: EMC product standard including specific test methods.

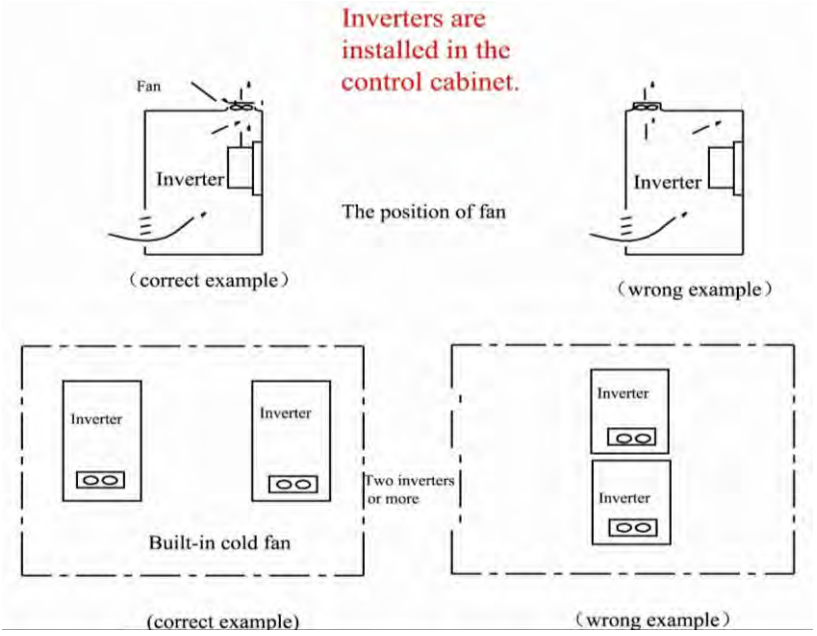
1.6 Safe instructions

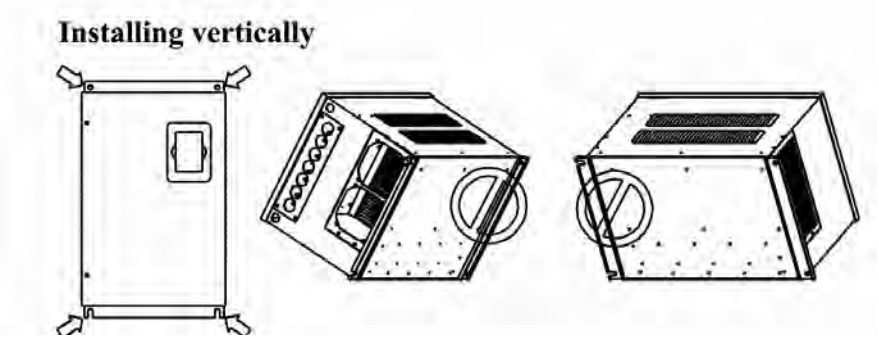
- Please check the model in the nameplate of the inverter and the rated value of the inverter. Please do not use the damaged inverter in transit.
- Installation and application environment should be free of rain, drips, steam, dust and oily dirt; without corrosive or flammable gases or liquids, metal particles or metal powder. Environment temperature within the scope of -10℃～+50℃.
- Please install inverter away from combustibles.
- Do not drop anything into the inverter.
- The reliability of inverters relies heavily on the temperature. The around temperature increases by 10℃, inverter life will be halved. The around temperature decreases by 10℃, inverter life will doubled. Because of the wrong installation or fixing, the temperature of inverter will increase and inverter will be damaged.
- Inverter is installed in a control cabinet, and smooth ventilation should be ensured.

1.7 Precautions

1.7.1 Instructions for use

- Never touch the internal elements within 15 minutes after power off. Wait till it is completely discharged.
- Input terminals R, S and T are connected to power supply of 400V while output terminals U, V and W are connected to motor and ⏚、PE(E) are connected to grounding.
- Proper grounding should be ensured with grounding resistance not exceeding 4Ω; separate grounding is required for motor and inverter. No grounding with series connection is allowed.
- No load switch is allowed at output while inverter is in operation.
- AC reactor or/and DC reactor is recommended when your inverter is above 37KW.
- There should be separate wiring between control loop and power loop to avoid any possible interference.
- Signal line should not be too long to avoid any increase with common mode interference.
- It shall comply with the requirements for surrounding environment as stipulated in Table 1-1 **"Technical Specifications for F2000–P Series Inverter"**.





1.7.2 Special Warning!!

- Never touch high-voltage terminals inside the inverter to avoid any electric shock.
- All safety covers should be well fixed before inverter is power connected, to

avoid any electric shock.

- Only professional personnel are allowed for any maintenance, checking or replacement of parts.
- No live-line job is allowed.

1.8 Maintenance

1.8.1 Checking

- Cooling fan should be cleaned regularly to check whether it is normal; remove the dust accumulated in the inverter on a regular basis.
- Check inverter‘s input and output wiring and wiring terminals regularly and check if wrings are aging.
- Replace inverter‘s cooling fan, starting contactor (relay) regularly.
- Check if all terminal wiring screws are fastened and if wirings are aging.

1.8.2 Replacement of expendable parts

The expendable parts include cooling fan and filter electrolytic capacitors.

- The useful life of the fan is 2~3 years. Users should change the cooling fan according to all running time of inverter. Cooling fan could be damaged because bearing is damaged and fan blades are aging. Users could check fan blades for cracks or check the abnormal vibration noise when starting. Users could change fan according to abnormal phenomena.
- The useful life of filter electrolytic capacitors is 4~5 years. Users should change the filter electrolytic capacitors according to all running time of inverter. Filter capacitors could be damaged because the power supply is unstable, the environment temperature is high, frequent over-load occurs and electrolyte is aging. Inspecting for the leakage of liquid and the safety valve bulges out and the static electricity and insulated resistor of the capacitor. Users could change the capacitor according to these phenomena.

1.8.3 Storage

- Please put the inverter in the packing case of manufacture.
- Please charge the inverter within half a year to prevent the electrolytic capacitors damaged. The charging time should be longer than 5 hours.

1.8.4 Maintenance

Environment temperature, humidity, dust and vibration would decrease the using life of inverter. So maintenance is necessary to inverter.

Daily inspecting:

- Inspecting for noise of motor when it is working.
- Inspecting for abnormal vibration of motor when it is working.
- Inspecting for the installing environment of inverter.
- Inspecting for the fan and inverter temperature.

Daily cleaning:

Keep the inverter clean. Clean surface dust of inverter to prevent dust, metal powder, oily dirt and water from dropping into the inverter.

II. Keypad panel

Keypad panel and monitor screen are both fixed on keypad controller. The keypad panel has two kinds of size, A3 series and A6 series.

Model	Remarks	Keypad panel
F2000-P0007T3B～F2000-P0075T3B	Plastic hanging	A3
F2000-P0110T3C～F2000-P0185T3C	Metal hanging	A3
F2000-P0220T3C～F2000-P3150T3C	Metal hanging	A6
F2000-P1100T3D～F2000-P7100T3D	Metal cabinet	A6

Structure diagram

Structure size (Unit: mm)

Code	A	B	C	D	H	Opening size
A3	74	50	72	48	15	49×73
A6	124	74	120	70	26	71×121

2.1 Panel Illustration

Two kinds of controllers (with and without potentiometer) are available for A3 serives keypad panle. Refer to note for Fig2-1.

F2000-P0007T3B～F2000-P0075T3B，F2000-P0110T3C～F2000-P0185T3C use A3 series keypad panel. The panel covers three sections: data display section, status indicating section and keypad operating section, as shown in Fig. 2-1.

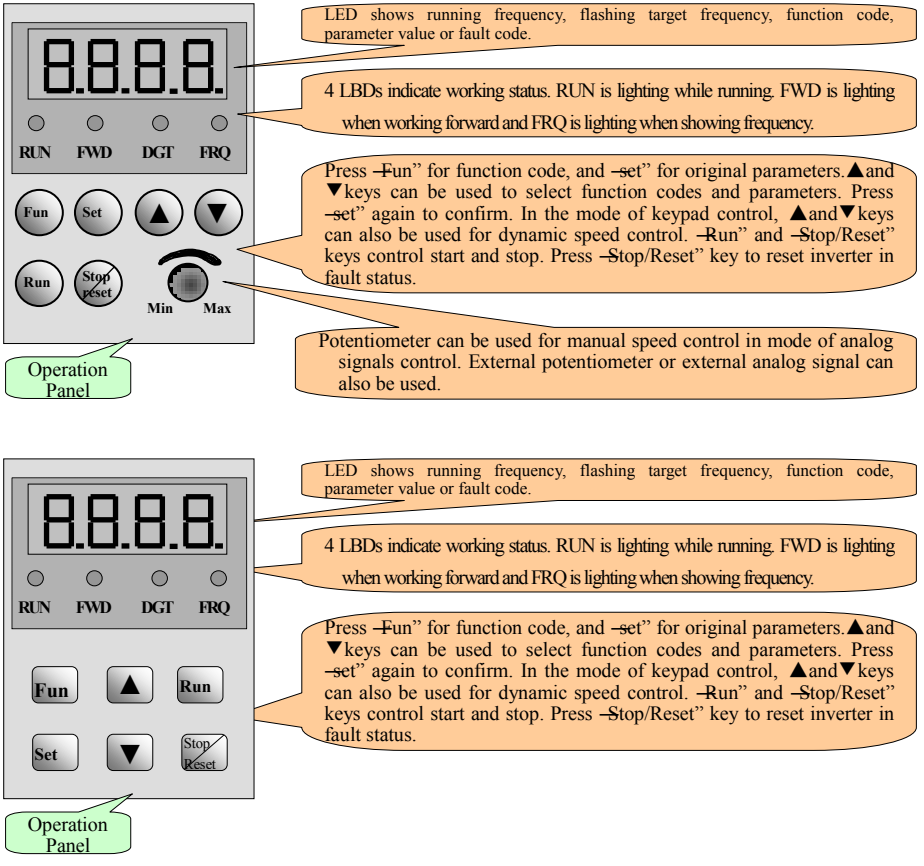
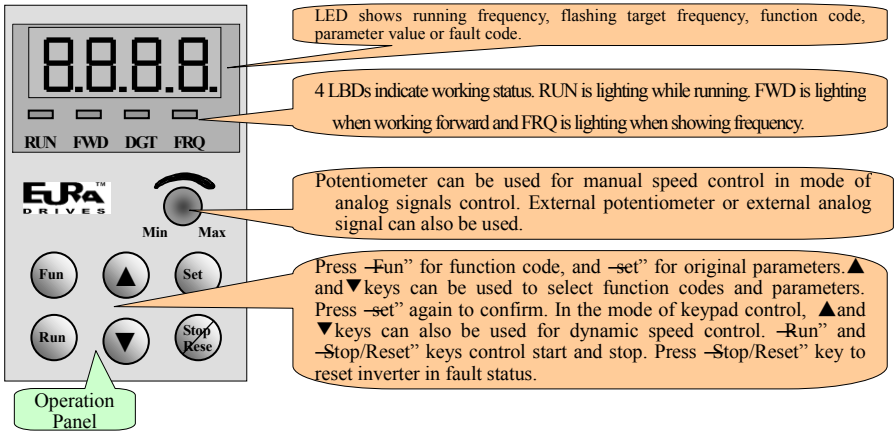

LED shows running frequency, flashing target frequency, function code, parameter value or fault code.
4 LBDs indicate working status. RUN is lighting while running. FWD is lighting when working forward and FRQ is lighting when showing frequency.
Press "Fun" for function code, and "set" for original parameters.▲and ▼keys can be used to select function codes and parameters. Press "set" again to confirm. In the mode of keypad control, ▲and▼keys can also be used for dynamic speed control. "Run" and "Stop/Reset" keys control start and stop. Press "Stop/Reset" key to reset inverter in fault status.
Potentiometer can be used for manual speed control in mode of analog signals control. External potentiometer or external analog signal can also be used.
RUN
FWD
DGT
FRQ
Fun
Set
Run
Stop reset
Min
Max
Operation Panel
LED shows running frequency, flashing target frequency, function code, parameter value or fault code.
4 LBDs indicate working status. RUN is lighting while running. FWD is lighting when working forward and FRQ is lighting when showing frequency.
Press "Fun" for function code, and "set" for original parameters.▲and ▼keys can be used to select function codes and parameters. Press "set" again to confirm. In the mode of keypad control, ▲and▼keys can also be used for dynamic speed control. "Run" and "Stop/Reset" keys control start and stop. Press "Stop/Reset" key to reset inverter in fault status.
RUN
FWD
DGT
FRQ
Fun
Run
Set
Stop Reset
Operation Panel

Fig.2-1 A3 Keypad Panels in Two Kinds

F2000-P0220T3C～F2000-P3150T3C，F2000-P1100T3D～F2000-P7100T3D use A6 series keypad panel. The panel covers three sections: data display section, status indicating section and keypad operating section, as shown in Fig. 2-1.


LED shows running frequency, flashing target frequency, function code, parameter value or fault code.
RUN FWD DGT FRQ
4 LBDs indicate working status. RUN is lighting while running. FWD is lighting when working forward and FRQ is lighting when showing frequency.
Min Max
Potentiometer can be used for manual speed control in mode of analog signals control. External potentiometer or external analog signal can also be used.
Fun Set Run Stop Rese
Press "Fun" for function code, and "set" for original parameters. ▲ and ▼ keys can be used to select function codes and parameters. Press "set" again to confirm. In the mode of keypad control, ▲ and ▼ keys can also be used for dynamic speed control. "Run" and "Stop/Reset" keys control start and stop. Press "Stop/Reset" key to reset inverter in fault status.
Operation Panel

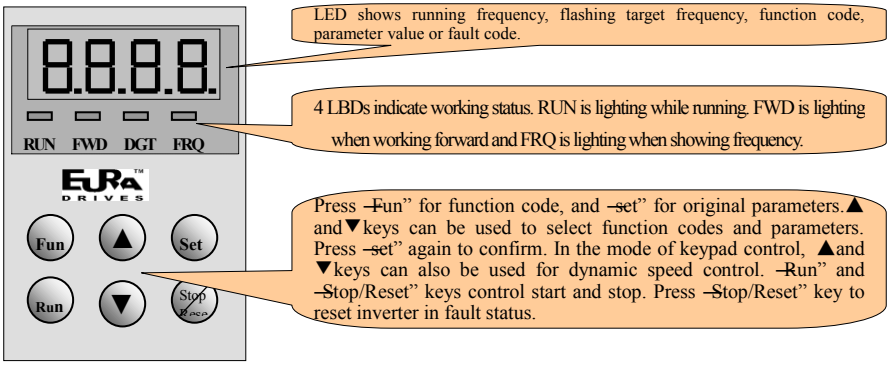

LED shows running frequency, flashing target frequency, function code, parameter value or fault code.
RUN FWD DGT FRQ
4 LBDs indicate working status. RUN is lighting while running. FWD is lighting when working forward and FRQ is lighting when showing frequency.
Fun Set Run Stop
Press "Fun" for function code, and "set" for original parameters. ▲ and ▼ keys can be used to select function codes and parameters. Press "set" again to confirm. In the mode of keypad control, ▲ and ▼ keys can also be used for dynamic speed control. "Run" and "Stop/Reset" keys control start and stop. Press "Stop/Reset" key to reset inverter in fault status.

Fig.2-2 A6 Keypad Panels in Two Kinds

2.2 Panel Operating

All keys on the panel are available for users. Refer to Table 2-1 for their functions.

Table 2-1 **Uses of Keys**

Keys	Names	Remarks
Fun Set ▲ ▼ Run Stop/reset	Function	To call function code and switch over display mode. To switch over different displays in stopping status and show various parameters (set by F132). To switch over different displays in running status and show various parameters (set by F131).
	Set	To call and save data.
	Up	To increase data (speed control or setting parameters)
	Down	To decrease data (speed control or setting parameters)
	Run	To start inverter.
	Stop or reset	To stop inverter; to change function codes in a code group or between two code groups; to reset in fault status (In PID protection, it only means stopping status.)

2.3 Parameters Setting

This inverter has numerous function parameters, which the user can modify to effect different modes of operation control. User needs to realize that user's password must be entered first if parameters are to be set after power off or protection is effected, i.e., to call F100 as per the mode in Table 2-2 and enter the correct code. Default value at manufacturer for user's password is 8.

Table 2-2 Steps for Parameters Setting

Steps	Keys	Operation	Display
1	Fun	Press "Fun" key to display function code	F100
2	▲ or ▼	Press "Up" or "Down" to select required function code	F114
3	Set	To read data set in the function code	5.0
4	▲ or ▼	To modify data	9.0
5	Set	To show corresponding target frequency by flashing after saving the set data	
	Fun	To display the current function code	F114

The above-mentioned step should be operated when inverter is in stop status.

2.4 Function Codes Switchover in/between Code-Groups

This has more than 300 parameters (function codes) available to user, divided into 10 sections as indicated in Table 2-3.

Table 2-3 Function Code Partition

Group Name	Function Code Range	Group No.	Group Name	Function Code Range	Group No.
Basic Parameters	F100～F160	1	Subsidiary function	F600～F630	6
Run Control Mode	F200～F230	2	Timing control and protection function	F700～F740	7
Multi-functional input/output terminal	F300～F330	3	Motor parameters	F800～F830	8
Analog signals of input/output	F400～F440	4	Communication function	F900～F930	9
PID parameters setting	F500～F590	5			

As parameters setting costs time due to numerous function codes, such function is specially designed as "Function Code Switchover in a Code Group or between Two Code-Groups" so that parameters setting become convenient and simple.

Press "Fun" key so that the keypad controller will display function code. If press "▲" or "▼" key then, function code will circularly keep increasing or decreasing by degrees within the group; if press again the "stop/reset" key, function code will change circularly between two code groups when operating the "▲" or "▼" key.

E.g. when function code shows F111, DGT indicator will be on. Press "▲"/ "▼" key, function code will keep increasing or decreasing by degrees within F100～F160; Press "stop/reset" key again, DGT indicator will be off. When pressing "▲"/ "▼" key, function codes will change circularly among the 10 code-groups, like F211, F311…FA11, F111…, Refer to Fig 2-2 (The sparkling "50.00" is indicated the corresponding target frequency values).

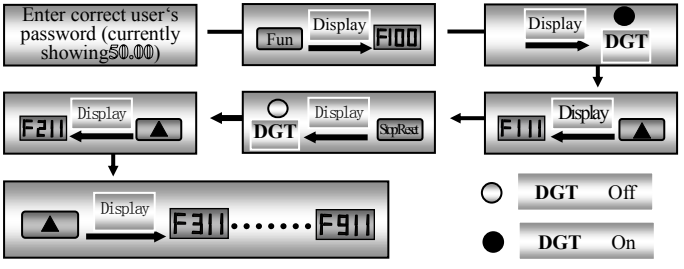


Fig 2-2 Swtich over in a Code Group or between Different Code-Groups

2.5 Panel Display

Table 2-4 Items and Remarks Displayed on the Panel

Items	Remarks
HF-0	This Item will be displayed when you press ~~F~~un" in stopping status, which indicates jogging operation is valid. But HF-0 will be displayed only after you change the value of 132.
-HF-	It stands for resetting process and will display ~~0~~" after reset.
OC, OE, OL1, OL2, OH, LU, PF1, CB	Fault code, indicating ~~o~~ver-current", ~~o~~ver-voltage", ~~in~~verter over-load", ~~m~~otor over-load" ~~o~~ver-heat", ~~un~~der-voltage for input", ~~o~~ut-phase for input" and ~~co~~ntactor fault" respectively.
PP, EP, NP, ERR3	~~L~~ine disconnection protection", ~~in~~verter detects lack water signal", ~~pr~~essure protection", ~~P~~ID parameters are set improperly".
H. H.	Interruption code, indicating ~~ex~~ternal interruption" signal input and showing ~~0~~" after reset.
F152	Function code (parameter code).
10.00	Indicating inverter's current running frequency (or rotate speed) and parameter setting values, etc.
50.00	Sparkling in stopping status to display target frequency.
0.	Holding time when changing the running direction. When ~~S~~top" or ~~F~~ree Stop" command is executed, the holding time can be canceled
A100、U100	Output current (100A) and output voltage (100V). Keep one digit of decimal when current is below 100A.
18.08	Displaying target time 18：08
b*.*	Displaying PID feedback value
H 21	Displaying radiator temperature 21℃
o*.*	Displaying PID setting value.
L***	Displaying linear speed.

III. Installation & Connection

3.1 Installation

Inverter should be installed vertically, as shown in Fig 3-1. Sufficient ventilation space should be ensured in its surrounding. Clearance dimensions (recommended) are available from Table 3-1 for installing the inverter.

Table 3-1 Clearance Dimensions

Inverter Model	Clearance Dimensions	
Hanging（＜22KW）	A≥150mm	B≥50mm
Hanging（≥22KW）	A≥200mm	B≥75mm
Cabinet (110～710KW)	C≥200mm	D≥75mm

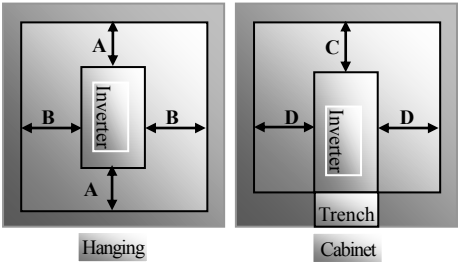
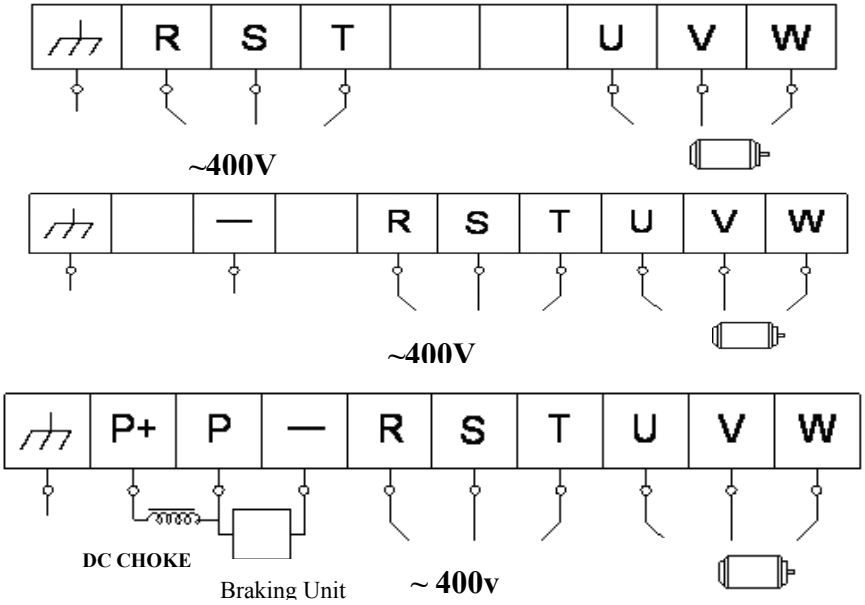


Fig 3-1 Installation Sketch

3.2 Connection

- In case of 3-phase input, connect R, S and T terminals with power source from network and ⏚, PE (E) to earthing, U, V and W terminals to motor.
- Motor shall have to be ground connected. Or else electrified motor causes interference.



(The figure is only sketch, terminals order of practical products may be different from the above-mentioned figure. Please pay attention when connecting wires)

Introduction of terminals of power loop

Terminals	Terminal Marking	Terminal Function Description
Power Input Terminal	R, S, T	Input terminals of three-phase 400V AC voltage
Output Terminal	U, V, W	Inverter power output terminal, connected to motor.
Grounding Terminal	⏚、PE（E）	Inverter grounding terminal.
DC terminals	P+、-（N）	DC bus-line output
	P、P+	Externally connected to DC reactor

Wiring for control loop as follows:

The following sketch is the control terminals for three-phase 0.75~710KW inverters.

A+	B-	DO1	DO2	+24V	CM	OP1	OP2	OP3	OP4	OP5	OP6	10V	AI1	GND	AI2	AO1	AO2	TA	TC

3.3 Wiring Recommended

Wiring for Power Loop

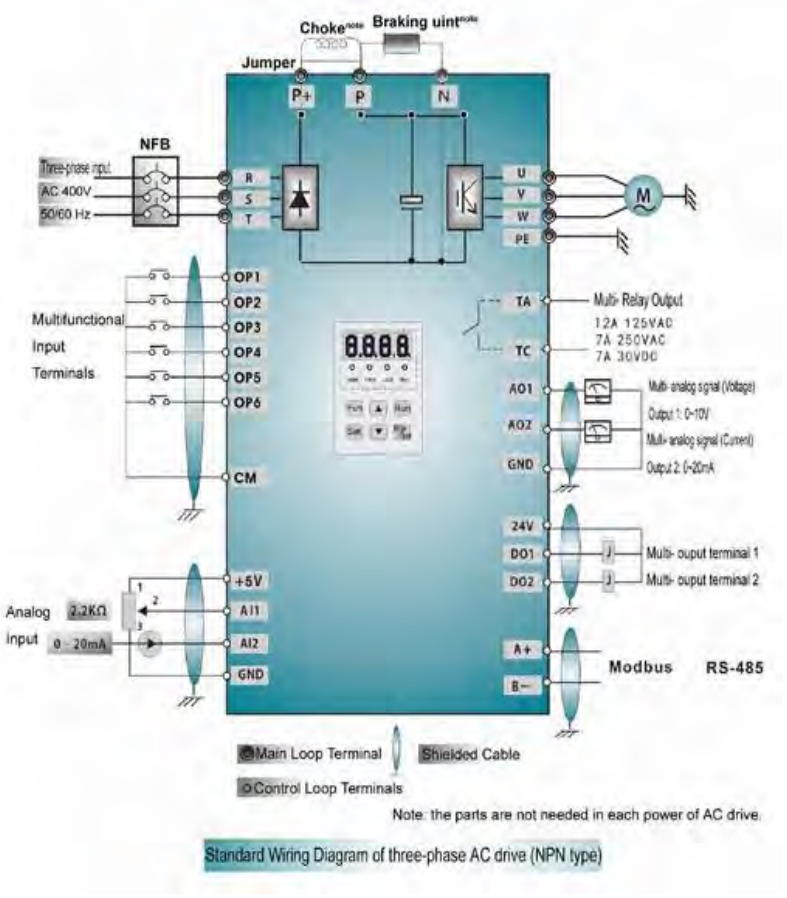
Inverter Model	Lead Section Area(mm^2)	Inverter Model	Lead Section Area(mm^2)	Inverter Model	Lead Section Area(mm^2)
F2000-P0007T3B	1.5	F2000-P0550T3C	35	F2000-P1600T3D	120
F2000-P0015T3B	2.5	F2000-P0750T3C	50	F2000-P2000T3D	150
F2000-P0022T3B	2.5	F2000-P0900T3C	70	F2000-P2200T3D	185
F2000-P0037T3B	2.5	F2000-P1100T3C	70	F2000-P2500T3D	240
F2000-P0040T3B	2.5	F2000-P1320T3C	95	F2000-P2800T3D	240
F2000-P0055T3B	4	F2000-P1600T3C	120	F2000-P3150T3D	300
F2000-P0075T3B	4	F2000-P1800T3C	150	F2000-P3550T3D	300
F2000-P0110T3C	6.0	F2000-P2000T3C	150	F2000-P4000T3D	400
F2000-P0150T3C	10	F2000-P2200T3C	185	F2000-P4500T3D	480
F2000-P0185T3C	16	F2000-P2500T3C	240	F2000-P5000T3D	520
F2000-P0220T3C	16	F2000-P2800T3C	240	F2000-P5600T3D	560
F2000-P0300T3C	25	F2000-P3150T3C	300	F2000-P6300T3D	720
F2000-P0370T3C	25	F2000-P1100T3D	70	F2000-P7100T3D	780
F2000-P0450T3C	35	F2000-P1320T3D	95		

3.4 Lead section area of protect conductor (grounding wire)

Lead section area S of U,V,W (mm^2)	Minimum lead section area S of E (mm^2)
$S \leq 16$	S
$16<S \leq 35$	16
$35<S$	S/2

3.5 Overall Connection and "Three- Line" Connection

Refer to next figure for overall connection sketch for F2000-P series inverters. Wiring mode is avaliable for various terminals whereas not every terminals connection when applied.

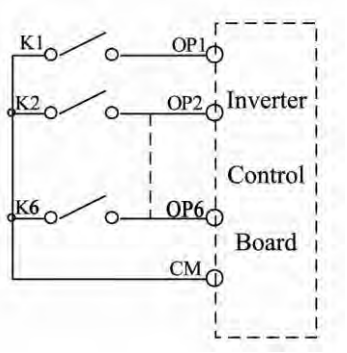


Standard Wiring Diagram of three-phase AC drive (NPN type)

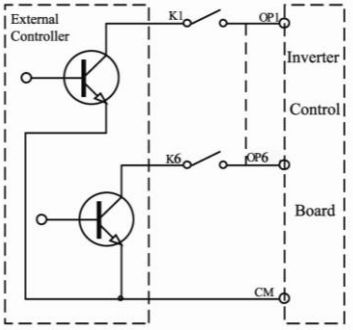
3.6 Wiring for digital input terminals

1. Digital input terminals are only connected by source electrode (NPN mode) or by drain electrode (PNP mode). If NPN mode is adopted, please turn the toggle switch to the end of "NPN".
Wiring for control terminals as follows:

a. Wiring for positive source electrode (NPN mode).

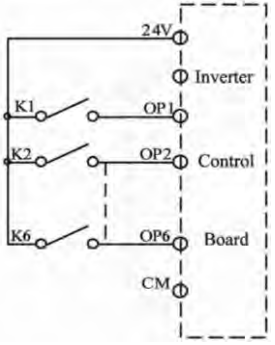


b. Wiring for active source electrode

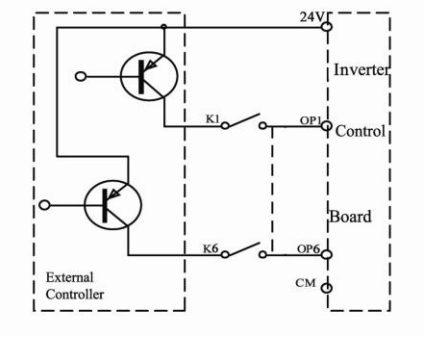


If digital input control terminals are connected by drain electrode, please turn the toggle switch to the end of –PNP". Wiring for control terminals as follows:

c. Wiring for positive drain electrode (PNP mode)



d. Wiring for active drain electrode (PNP mode)



2. Instructions of choosing NPN mode or PNP mode:

When turning J7 to "NPN", OP terminal is connected to CM.

When turning J7 to "PNP", OP terminal is connected to 24V.

Fig 3-2 Toggle Switch

IV. Operation and Simple Running

This chapter defines and interprets the terms and nouns describing the control, running and status of the inverter. Please read it carefully. It will be helpful to your correct operation.

4.1 Control mode

F2000-P inverter control mode: V/F control (F106=2).

4.2 Mode of frequency setting

Please refer to F203~F207 for the method and channel for setting the running frequency (speed) of inverter.

4.3 Mode of controlling for running command

The channel for inverter to receive control commands (including start, stop and jogging, etc) contains three modes: 1. Keyboard (keypad panel) control; 2. External terminal control; 3. Serial communication control.

The modes of control command can be selected through the function codes F200 and F201.

4.4 Operating status of inverter

When the inverter is powered on, it may have four kinds of operating status: stopped status, programming status, running status, and fault alarm status. They are described in the following:

4.4.1 Stopped status

If re-energize the inverter (if "self-startup after being powered on" is not set) or decelerate the inverter to stop the output, the inverter is at the stopped status until receiving control command. At this moment, the running status indicator on the keyboard goes off, and the display shows the display status before power down.

4.4.2 Programming status

Through keypad panel, the inverter can be switched to the status that can read or change the function code parameters. Such a status is the programming status.

There are numbers of function parameters in the inverter. By changing these parameters, the user can realize different control modes.

4.4.3 Running status

The inverter at the stopped status or fault-free status will enter running status after having received operation command.

The running indicator on keypad panel lights up under normal running status.

4.4.4 Fault alarm status

The status under which the inverter has a fault and the fault code is displayed.

Fault codes mainly include: OC, OE, OL1, OL2, OH, LU, PF1, and CB, representing "over current", "over voltage", "inverter overload", "motor overload", "overheat", "input undervoltage", "input out-phase", and "contactor fault" respectively.

For trouble shooting, please refer to Appendix I to this manual, "Trouble Shooting".

4.5 Keypad panel and operation method

Keypad panel (keyboard) is a standard part for configuration of F2000-P inverter. Through keypad panel, the user may carry out parameter setting, status monitoring and operation control over the inverter. Both keypad panel and display screen are arranged on the keyboard controller, which mainly consists of three sections: data display section, status indicating section, and keyboard operating section.

It is necessary to know the functions and how to use the keypad panel. Please read this manual carefully before operation.

4.5.1 Method of operating the keypad panel

(1) Operation flow of setting the parameters through keypad panel

A three-level menu structure is adopted for setting the parameters through keypad panel of inverter, which enables convenient and quick searching and changing of function code parameters.

Three-level menu: Function code group (first-level menu) → Function code (second-level menu) → Set value of each function code (third-level menu).

(2) Setting the parameters

Setting the parameters correctly is a precondition to give full play of inverter performance. The following is the introduction on how to set the parameters through keypad panel.

Operating procedures:

① Press the "Fun" key, to enter programming menu.

② Press the key "Stop/Reset", the DGT lamp goes out. Press ▲ and ▼, the function code will change within the function code group. The first number behind F displayed on the panel is 1, in other words, it displays F1××at this moment.

③ Press the key "Stop/Reset" again, the DGT lamp lights up, and the function code will change within the code group. Press ▲ and ▼ to change the function code to F132; press the "Set" key to display 10; while press ▲ and ▼ to change the value.

④ Press the "Set" key to complete the change.

4.5.2 Switching and displaying of status parameters

Under stopped status or running status, the LED digitron of inverter can display status parameters of the inverter. Actual parameters displayed can be selected and set through the set value of function codes F131 and F132. Through the "Fun" key, it can switch over repeatedly and display the parameters of stopped status or running status. The followings are the description of operation method of displaying the parameters under stopped status and running status.

(1) Switching of the parameters displayed under stopped status

Under stopped status, inverter has seven parameters of stopped status, which can be switched over repeatedly and displayed with the keys "Fun" and "Stop/reset". These parameters are displaying: present frequency, keyboard jogging, PN voltage, PID setting value, PID feedback value, temperature and time. Please refer to the description of function code F132.

(2) Switching of the parameters displayed under running status

Under running status, nine parameters of running status can be switched over repeatedly and displayed with the keys "Fun" and "Stop/Reset". These parameters are displaying: present frequency, output current, output voltage, PN voltage, PID setting value, PID feedback value, temperature, time and linear speed. Please refer to the description of function code F131.

4.6 Operation flow of simple running

Table 4-1 shows a brief introduction to inverter operation flow.

Table 4-1 Brief Introduction to Inverter Operation Flow

Flow	Operation	Reference
Installation and operation environment	Install the inverter at a location meeting the technical specifications and requirements of the product. Mainly take into consideration the environment conditions (temperature, humidity, etc) and heat radiation of the inverter, to check whether they can satisfy the requirements.	See Chapters I, II, III.
Wiring of the inverter	Wiring of main circuit input and output terminals; wiring of grounding; wiring of switching value control terminal, analog terminal, and communication interface, etc.	See Chapter III.
Checking before getting energized	Make sure that the voltage of input power supply is correct; the input power supply loop is connected with a breaker; the inverter has been grounded correctly and reliably; the power cable is connected to the power supply input terminals R, S, and T of the inverter correctly; the output terminals U, V, and W of the inverter are connected to the motor correctly; the wiring of control terminals is correct; all the external switches are preset correctly; and the motor is under no load (the mechanical load is disconnected from the motor).	See Chapters I～III, and Chapter XII.
Checking immediately after energized	Check if there is any abnormal sound, fuming or foreign flavor with the inverter. Make sure that the display of keypad panel is normal, without any fault alarm message. In case of any abnormality, switch off the power supply immediately.	See Appendix 1 and Appendix 2.
Setting running control parameters	Set the parameters of the inverter and the motor correctly, which mainly include target frequency, Max/Min frequency limits, acceleration/deceleration time, and direction control command, etc. The user can select corresponding running control mode according to actual applications.	See description of parameter group.

Checking under no load	With the motor under no load, start the inverter with the keyboard or control terminal. Check and confirm running status of the drive system. Motor's status: stable running, normal running, correct rotary direction, normal acceleration/deceleration process, free from abnormal vibration, abnormal noise and foreign flavor. Inverter' status: normal display of the data on keypad panel, normal running of the fan, normal acting sequence of the relay, free from the abnormalities like vibration or noise. In case of any abnormality, stop and check the inverter immediately.	See Chapter VIII.
Checking under with load	After successful test run under no load, connect the load of drive system properly. Start the inverter with the keyboard or control terminal, and increase the load gradually. When the load is increased to 50% and 100%, keep the inverter run for a period respectively, to check if the system is running normally. Carry out overall inspection over the inverter during running, to check if there is any abnormality. In case of any abnormality, stop and check the inverter immediately.	
Checking during running	Check if the motor is running stably, if the rotary direction of the motor is correct, if there is any abnormal vibration or noise when the motor is running, if the acceleration/deceleration process of the motor is stable, if the output status of the inverter and the display of keypad panel is correct, if the blower fan is run normally, and if there is any abnormal vibration or noise. In case of any abnormality, stop the inverter immediately, and check it after switching off the power supply.	

4.7 Illustration of basic operation

Illustration of inverter basic operation: we hereafter show various basic control operation processes by taking a 7.5kW inverter that drives a 7.5kW three-phase asynchronous AC motor as an example.

The parameters indicated on the nameplate of the motor are as follows: 4 poles; rated power, 7.5KW; rated voltage, 400V; rated current, 15.4A; rated frequency 50.00HZ; and rated rotary speed, 1440rpm.

4.7.1 Operation processes of frequency setting, start, forward running and stop with keypad panel

(1) Connect the wires in accordance with Figure 4-1. After having checked the wiring successfully, switch on the air switch, and power on the inverter.

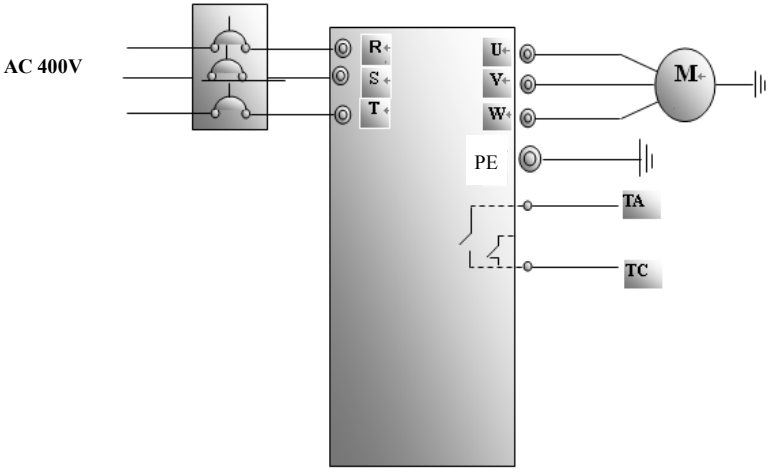


Figure 4-1 Wiring Diagram 1

(2) Press the "Fun" key, to enter the programming menu.

(3) Set functional parameters of the inverter:

①Enter F203 parameter and set it to 0;
②Enter F113 parameter and set the frequency to 50.00Hz;
③Enter F200 parameter and set it to 0; select the mode of start to keyboard control;
④Enter F201 parameter and set it to 0; select the mode of stop to keyboard control;
⑤Enter F202 parameter and set it to 0; select coratation locking.

(4) Press the "Run" key, to start the inverter;

(5) During running, current frequency of the inverter can be changed by pressing ▲ or ▼;

(6) Press the "Stop/Reset" key once, the motor will decelerate until it stops running;

(7) Switch off the air switch, and deenergize the inverter.

4.7.2 Operation process of setting the frequency with keypad panel, and starting, forward and reverse running, and stopping inverter through control terminals

(1) Connect the wires in accordance with Figure 4-2. After having checked the wiring successfully, switch on the air switch, and power on the inverter;

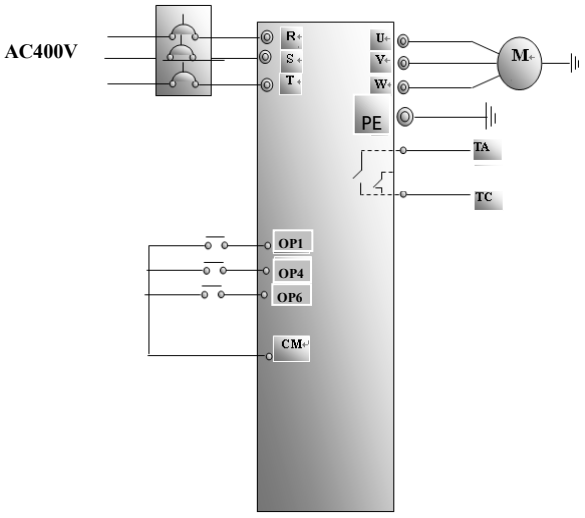


Figure 4-2 Wiring Diagram 2

(2) Press the "Fun" key, to enter the programming menu.

(3) Set functional parameters of the inverter:

①Enter F203 parameter and set it to 0; select the mode of frequency setting to digital given memory;
②Enter F113 parameter and set the frequency to 50.00Hz;
③Enter F208 parameter and set it to 1; select two-line control mode 1 (Note: when F208 ≠0, F200, F201 and F202 will be invalid.)

(4) Close the switch OP4, the inverter starts forward running;

(5) During running, present frequency of the inverter can be changed by pressing ▲ or ▼;

(6) During running, switch off the switch OP4, then close the switch OP6, the running direction of the motor will be changed (Note: The user should set the dead time of forward and reverse running F120 on the basis of the load. If it was too short, OC protection of the inverter may occur.)

(7) Switch off the switches OP4 and OP6, the motor will decelerate until it stops running;

(8) Switch off the air switch, and deenergize the inverter.

4.7.3 Operation process of jogging operation with keypad panel

(1) Connect the wires in accordance with Figure 4-1. After having checked the wiring successfully, switch on the air switch, and power on the inverter;

(2) Press the "Fun" key, to enter the programming menu.

(3) Set functional parameters of the inverter:

① Enter F132 parameter and set it to 1; select keyboard jogging;
②Enter F200 parameter and set it to 0; select the mode of running command control by keyboard operation;
③Enter F124 parameter, and set the jogging operation frequency to 5.00Hz;

④Enter F125 parameter, and set the jogging acceleration time to 30S;
⑤Enter F126 parameter, and set the jogging deceleration time to 30S;
⑥Enter F202 parameter, and set it to 0; select forward running locking.

(4) Press and hold the "Run" key until the motor is accelerated to the jogging frequency, and maintain the status of jogging operation.

(5) Release the "Run" key. The motor will decelerate until jogging operation is stopped;

(6) Switch off the air switch, and deenergize the inverter.

4.7.4 Operation process of setting the frequency with analog terminal and controlling the operation with control terminals

(1) Connect the wires in accordance with Figure 4-3. After having checked the wiring successfully, switch on the air switch, and power on the inverter. Note: 2K～5K potentiometer may be adopted for setting external analog signals. For the cases with higher requirements for precision, please adopt precise multiturn potentiometer, and adopt shielded wire for the wire connection, with near end of the shielding layer grounded reliably.

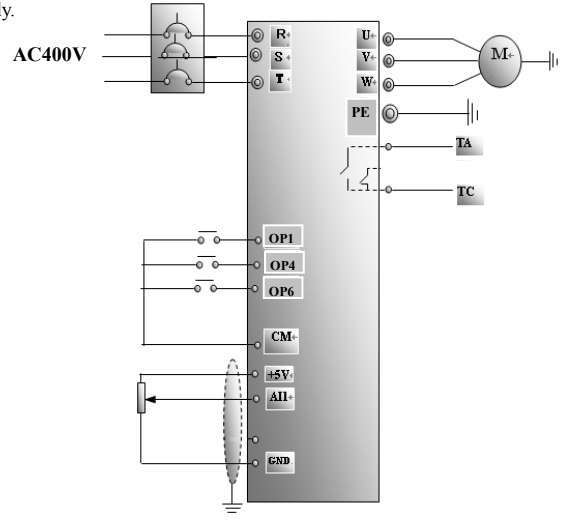


Figure 4-3 Wiring Diagram 3

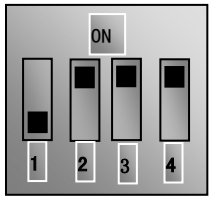
(2) Press the "Fun" key, to enter the programming menu.

(3) Set functional parameters of the inverter:

①Enter F203 parameter, and set it to 1; select the mode of frequency setting of analog AI1, 0～10V voltage terminal;
②Enter F208 parameter, and set it to 1; select direction terminal (set OP5 to free stop, set OP4 to reverse running, set OP6 to forward running) to control running;

(4) There is a red four-digit coding switch SW1 near the control terminal block of three-phase inverter,

as shown in Figure 4-4. The function of coding switch is to select the input range (0～5V/0～10V/0~20mA) of analog input terminal AI1. In actual application, select the analog input channel through F203. Turn switch 1 to OFF and turn switch 3 to ON as illustrated in the figure, and select 0～10V voltage speed control.



SW1

Fig 4-4

(5) Close the switch OP4, the motor starts forward running;

(6) The potentiometer can be adjusted and set during running, and the current setting frequency of the inverter can be changed;

(7) During running, switch off the switch OP4, then, close OP6, the running direction of the motor will be changed;

(8) Switch off the switches OP4 and OP6, the motor will decelerate until it stops running;

(9) Switch off the air switch, and power off the inverter.

Table 4-2

The Setting of Coding Switch and Parameters in the Mode of Analog Speed Control

Set F203 to 1, to select channel AI1			Set F203 to 2, to select channel AI2		
Coding Switch 1	Coding Switch 3	Mode of Speed Control	Coding Switch 2	Coding Switch 4	Mode of Speed Control
OFF	OFF	5V voltage	OFF	OFF	5V voltage
OFF	ON	10V voltage	OFF	ON	10V voltage
ON	ON	0～20mA current	ON	ON	0～20mA current
ON refers to switching the coding switch to the top.					
OFF refers to switching the coding switch to the bottom.					

4.8 Functions of control terminals

The key to operate the inverter is to operate the control terminals correctly and flexibly. Certainly, the control terminals are not operated separately, and they should match corresponding settings of parameters. This chapter describes basic functions of the control terminals. The users may operate the control terminals by combining relevant contents hereafter about "Defined Functions of the Terminals".

Table 4-3 **Functions of Control Terminals**

Terminal	Type	Description	Function	
DO1	Output signal	Multifunctional output terminal 1	When the token function is valid, the value between this terminal and CM is 0V; the value between this terminal and 24V is DC24V.	The functions of output terminals shall be defined per manufacturer's value. Their initial state may be changed through changing function codes.
DO2		Multifunctional output terminal 2	When the function is valid, the value between this terminal and CM is 0V; the value between this terminal and 24V is DC24V.	
TA		Relay contact	TA-TC are normally open contacts. The contact current is not more than 2A, and voltage not more than 250VAC.	
TC				
AO1		Running frequency	It is connected with frequency meter or speedometer externally, and its minus pole is connected with GND. See F423～F426 for details。	
AO2		Current display	It is connected with ammeter externally, and its minus pole is connected with GND. See F427～F430 for details	
10V	Voltage control	10V power supply	Internal 10V self-contained power supply of the inverter provides power to the inverter. When used externally, it can only be used as the power supply for voltage control signal, with current restricted below 20mA.	
GND		Ground of 10V	Ground terminal of external control signal (voltage control signal or current source control signal) is also the source of 10V power supply of this inverter.	
AI1	Analog input channel	Channel 1	Analog channel 1, the default value is 0-10V voltage input. 0-5V and 0-20mA are selected, the grounding is GND. When potentiometer speed control is adopted, this terminal is connected with center tap, earth wire to be connected to GND.	
AI2		Channel 2	Analog channel 2, the default value is 0-20mA current input. 0-5V and 0-10V are selected, the grounding is GND. If the input is 4～20mA, it can be realized through adjusting relevant parameter.	
24V	Power supply	Control power supply	Power: 24±1.5V, grounding: CM; current is restricted below 50mA for external use.	
OP1	Function operation	Forward jogging terminal. When this terminal is connected with CM (or 24V), the inverter will have forward jogging running.		The functions of input terminals shall be defined per manufacturer's value. Other functions can also be defined by changing function codes.
OP2		Water lack signal terminal. When this terminal is connected with CM (or 24V), the inverter will display EP.		
OP3		Signal of water terminal. In running status, this terminal is connected with CM (or 24V), EP malfunction will disappear.		
OP4		Reverse running command. When this terminal is connected with CM (or 24V), the inverter will run reverse.		
OP5		Free stop. When this terminal is connected with CM (or 24V), inverter will free stop.		
OP6		Forward running command. When this terminal is connected with CM (or 24V), the inverter will run forward.		
CM	Common port	Grounding of 24V	The grounding of 24V power supply and OP control signals.	

V. Basic Parameters

5.1 Basic Parameters

F100 User's Password	Setting range: 0～9999	Mfr's value: 8

·When F107=1 with valid password, the user must enter correct user's password after power on or fault reset if you intend to change parameters. Otherwise, parameter setting will not be possible, and a prompt "Err1" will be displayed.

Relating function code: F107 Password valid or not

F108 Setting user's password

F102 Inverter's Rated Current (A)	Setting range: 2.0～6500	Mfr's value: Subject to inverter model
F103 Inverter Power (KW)	Setting range: 0.75～710	Mfr's value: Subject to inverter model

· Rated current and rated power can only be checked but cannot be modified.

F105 Software Edition No.	Setting range: 1.00～10.00	Mfr's value: Subject to inverter model

Software Edition No. can only be checked but cannot be modified.

F106 Control mode	Setting range: 2: V/F	Mfr's value: 2

F107 Password Valid or Not	Setting range: 0: invalid; 1: valid	Mfr's value: 0
F108 Setting User's Password	Setting range: 0～9999	Mfr's value: 8

·When F107 is set to 0, the function codes can be changed without inputting the password.

·When F107 is set to 1, the function codes can be changed only after inputting the user's password.

·The user can change "User's Password" by F108. The operation process is the same as those of changing other parameters.

· Input the value of F108 into F100, and the user's password can be unlocked.

Note: When password protection is valid, and if the user's password is not entered, F108 will display 0.

F109 Starting Frequency (Hz)	Setting range: 0.00～10.00	Mfr's value: 0.00 Hz
F110 Holding Time of Starting Frequency (S)	Setting range: 0.0～10.0	Mfr's value: 0.0

·The inverter begins to run from the starting frequency. If the setting frequency is lower than starting frequency, inverter can not run.

·The inverter begins to run from the starting frequency. After it keeps running at the starting frequency for the time as set in F110, it will accelerate to target frequency. The holding time is not included in acceleration/deceleration time.

·Starting frequency is not limited by the Min frequency set by F112. If the starting frequency set by F109 is lower than Min frequency set by F112, inverter will start according to the setting parameters set by F109 and F110. After inverter starts and runs normally, the frequency will be limited by frequency set by F111 and F112.

·Starting frequency should be lower than Max frequency set by F111.

F111 Max Frequency (Hz)	Setting range: F113～60.0	Mfr's value: 50.00Hz
F112 Min Frequency (Hz)	Setting range: 0.00～F113	Mfr's value: 0.50Hz

· Max frequency is set by F111 (The max frequency is 60.00Hz in the V/F control).

· Min frequency is set by F112.

· The setting value of min frequency should be lower than target frequency set by F113.

· The inverter begins to run from the starting frequency. During inverter running, if the given frequency is lower than min frequency, then inverter will run at min frequency until inverter stops or given frequency is higher than min frequency.

Note:

Max/Min frequency should be set according to the nameplate parameters and running situations of motor. The motor is forbidden running at low frequency for a long time, or else motor will be damaged because of overheat.

F113 Target Frequency (Hz)	Setting range: F112～F111	Mfr's value: 50.00Hz

·It shows the preset frequency. When main frequency source is "digital given", the value of this function is the frequency initial value by digital given. Under keyboard speed control or terminal speed control mode, the inverter will run to this frequency automatically after startup.

F114 First Acceleration Time (S)	Setting range: 0.1～3000S	Mfr's value:	For 0.75～3.7KW, 5.0S For 5.5～30KW, 30.0S For 37～90KW, 60.0S For 110~710KW, 120.0S
F115 First Deceleration Time (S)			
F116 Second Acceleration Time (S)		Mfr's value:	For 0.75～3.7KW, 11.0S For 5.5～30KW, 80.0S For 37～90KW, 120.0S For 110~710KW, 150.0S
F117 Second Deceleration Time (S)			

·Acceleration Time: The time for inverter to accelerate to 50Hz from 0Hz

·Deceleration Time: The time for inverter to decelerate to 0Hz from 50Hz

· The second Acceleration/Deceleration time can be chosen by multifunction digital input terminals F316~F323.

F118 Turnover Frequency (Hz)	Setting range: 15.00～60.0	Mfr's value: 50.00Hz

· Turnover frequency is the final frequency of V/F curve, which is the least frequency according to the highest output voltage.

· Generally, turnover frequency is the same with motor rated frequency.

·When running frequency is lower than this value, inverter has constant-torque output. When running frequency exceeds this value, inverter has constant-power output.

F120 Forward / Reverse Switchover dead-Time (S)	Setting range: 0.0～3000	Mfr's value: 1.0S

·This function can decrease current surging during direction switchover.

Within "forward/ reverse switchover dead-time", this latency time will be cancelled upon receiving "stop" signal. This function is suitable for all the speed control modes.

F122 Reverse Running Forbidden	Setting range: 0: invalid; 1: valid	Mfr's value: 0

When F122=1, inverter will only run forward no matter the state of terminals and the parameters set by F202.

Inverter will not run reverse and forward / reverse switchover is forbidden. If reverse signal is given, inverter will stop.

F124 Jogging Frequency (Hz)	Setting range: F112～F111		Mfr's value: 5.00Hz
F125 Jogging Acceleration Time (S)	Setting range: 0.1～3000	Mfr's value:	For 0.75～3.7KW, 5.0S For 5.5～30KW, 30.0S For 37～90KW, 60.0S For 110~710KW, 120.0S
F126 Jogging Deceleration Time (S)			

·There are two types of jogging: keyboard jogging and terminal jogging. Keyboard jogging is valid only under

stopped status (F132 should be set). Terminal jogging is valid under both running status and stopped status.

·Carry out jogging operation through the keyboard (under stopped status):

a. Press the "Run" key, it will display "HF-0";

b. Press the "Run" key, the inverter will run to "jogging frequency" (if pressing "Run" key again, "keyboard jogging" will be cancelled).

· In case of terminal jogging, make "jogging" terminal (such as OP1) connected to CM, and inverter will run to jogging frequency. The related function codes are from F316 to F321.

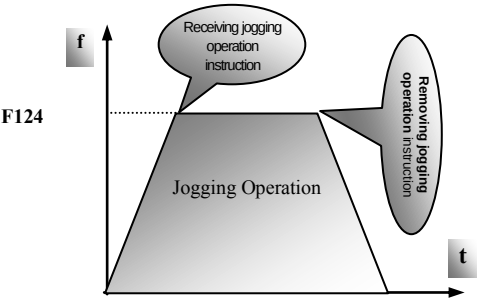


Figure 5-1 Jogging Operation

F127/F129	Skip Frequency A,B (Hz)	Setting range: 0.00～60.0	Mfr's value:0.00Hz
F128/F130	Skip Width A,B (Hz)	Setting range: ±2.5	Mfr's value: 0.0

· Systematic vibration may occur when the motor is running at a certain frequency. This parameter is set to skip this frequency.

·The inverter will skip the point automatically when output frequency is equal to the set value of this parameter.

·"Skip Width" is the span from the upper to the lower limits around Skip Frequency. For example, Skip Frequency=20Hz, Skip Width=±0.5Hz, inverter will skip automatically when output is between 19.5～20.5Hz.

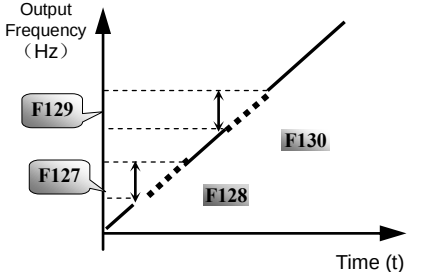


Figure 5-2 Skip Frequency

·This function is invalid during acceleration/deceleration.

F131 Running Display Items	0－Present output frequency / function code 1－Present time 2－Output current 4－Output voltage 8－PN voltage 16－PID feedback value 32－Temperature 64－PID setting value 128－Linear speed 256－Speed 512－Motor output power	Mfr's value: 0＋1+2+4＋8＋16＋64＝95

·Selection of one value from 0, 1, 2, 4, 8, 16, 32, 64, 128, 256 and 512 shows that only one specific display item is selected. Should multiple display items be intended, add the values of the corresponding display items

and take the total values as the set value of F131, e.g., just set F131 to be 19 (1+2+16) if you want to call ―present time", ―output current" and ―PID feedback value". The other display items will be covered.

When F512 is valid, please set the motor parameters from F801 to F805 and F810.

·As F131＝511, all display items are visible, of which, ―frequency / function code" will be visible whether or not it is selected.

·Should you intend to check any display item, just press the ―Fun" key for switchover.

·Refer to the following table for each specific value unit and its indication:

·Whatever the value of F131 is set to, corresponding target frequency will flash under stopped status.

Target time display **.**

Current display A *.**

Voltage display U***

PID feedback value display b*.*

Temperature H*.**

PID setting value o*.*

Linear speed L***. If it exceeds 999, add a decimal point to it. If it exceeds 9999, add two decimal points to it, and the like.

F132 Display items of stop	Setting range: 0: Frequency / Function code 1: Keyboard jogging 2: PID setting value 4: PN voltage 8: PID feedback value 16: Temperature 32: time 65: Speed	Mfr's value: 0+2+4+8+32=46
F133 Drive ratio of driven system	Setting range: 0.10～200.0	Mfr's value: 1.00
F134 Transmission-wheel radius	0.001～1.000(m)	Mfr's value: 0.001

·Calculation of rotary speed and linear speed:

For example, If inverter's max frequency F111 is 50.00Hz, numbers of motor poles F804 is 4, drive ratio F133 is 1.00, transmission-shaft radius R is 0.05m, then

Transmission shaft perimeter: 2πr =2×3.14×0.05=0.314 (meter)

Transmission shaft rotary speed: 60× operation frequency/ (numbers of poles pairs × drive ratio) =60×50/ (2×1.00) =1500rpm

Endmost linear speed: rotary speed × perimeter=1500×0.314＝471(meters/second)

F136 Slip compensation	Setting range: 0～10%	Mfr's value: 0

· Under V/F controlling, rotary speed of motor rotor will decrease as load increases. Be assured that rotor rotary speed is near to synchronization rotary speed while motor with rated load, slip compensation should be adopted according to the setting value of frequency compensation.

F137 Modes of torque compensation	Setting range: 0: Linear compensation; 1: Square compensation; 2: User-defined multipoint compensation	Mfr's value: 0
F138 Linear compensation	Setting range: 1～16	Mfr's value: subject to power 0.75-4.0：5 5.5-22：3 30-75：2 Above 90：1

F139 Square compensation	Setting range: 1: 1.5 2: 1.8 3: 1.9 4: 2.0	Mfr's value: 1

To compensate low-frequency torque controlled by V/F, output voltage of inverter while low-frequency should be compensated.

When F137=0, linear compensation is chosen and it is applied on universal constant-torque load;

When F137=1, square compensation is chose and it is applied on the loads of fan or water pump;

When F137=2, user-defined multipoint compensation is chosen and it is applied on the special loads of spin-drier or centrifuge;

This parameter should be increased when the load is heavier, and this parameter should be decreased when the load is lighter.

If the torque is elevated too much, motor is easy to overheat, and the current of inverter will be too high. Please check the motor while elevating the torque.

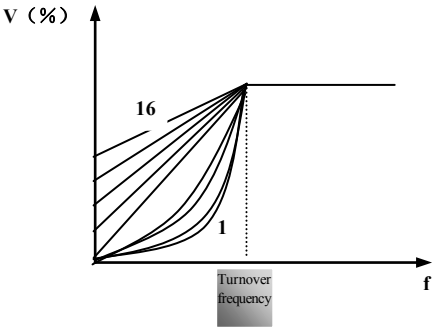


Fig 5-3 Torque Promotion

F140 User-defined frequency point 1	Setting range: 0～F142	Mfr's value: 1.00
F141 User-defined voltage point 1	Setting range: 0～100%	Mfr's value: 4
F142 User-defined frequency point 2	Setting range: F140～F144	Mfr's value: 5.00
F143 User-defined voltage point 2	Setting range: 0～100%	Mfr's value: 13
F144 User-defined frequency point 3	Setting range: F142～F146	Mfr's value: 10.00
F145 User-defined voltage point 3	Setting range: 0～100%	Mfr's value: 24
F146 User-defined frequency point 4	Setting range: F144～F148	Mfr's value: 20.00
F147 User-defined voltage point 4	Setting range: 0～100%	Mfr's value: 45
F148 User-defined frequency point 5	Setting range: F146～F150	Mfr's value: 30.00
F149 User-defined voltage point 5	Setting range: 0～100%	Mfr's value: 63
F150 User-defined frequency point 6	Setting range: F148～F118	Mfr's value: 40.00
F151 User-defined voltage point 6	Setting range: 0～100%	Mfr's value: 81

Multi-stage V/F curves are defined by 12 parameters from F140 to F151.

The setting value of V/F curve is set by motor load characteristic.

Note: V1<V2<V3<V4<V5<V6，F1<F2<F3<F4<F5<F6. As low-frequency, if the setting voltage is too high, motor will overheat or be damaged. Inverter will be stalling or occur over-current protection.

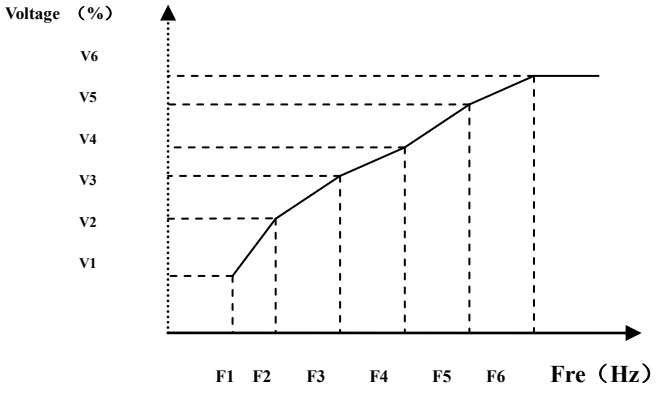


Fig 5-4 Polygonal-Line Type V/F

F152 Output voltage corresponding to turnover frequency	Setting range: 10～100%	Mfr's value: 100

This function can meet the needs of some special loads, for example, when the frequency outputs 60Hz and corresponding voltage outputs 200V (supposed voltage of inverter power supply is 400V), turnover frequency F118 should be set to 60Hz and F152 is set to（200÷400）×100=50。

Please notice nameplate parameters of motor. If the working voltage is higher than rated voltage or the frequency is higher than rated frequency, motor would be damaged.

F153 Carrier frequency setting	Setting range: 1K~10K	Mfr's value: subject to power 0.7-7.5: 5000 11-30: 4000 37~90: 3000 Over 110: 2000

Carrier-wave frequency of inverter is adjusted by setting this function code. Adjusting carrier-wave may reduce motor noise, avoid point of resonance of mechanical system, decrease leakage current of wire to earth and the interference of inverter.

When carrier-wave frequency is low, although carrier-wave noise from motor will increase, the current leaked to the earth will decrease. The wastage of motor and the temperature of motor will increase, but the temperature of inverter will decrease.

When carrier-wave frequency is high, the situations are opposite.

When output frequency of inverter is adjusted to high frequency, the setting value of carrier-wave should be increased. Performance is influenced by adjusting carrier-wave frequency as below table:

Carrier-wave frequency	Low	→	High
Motor noise	Loud	→	Low
Waveform of output current	Bad	→	Good
Motor temperature	High	→	Low
Inverter temperature	Low	→	High
Leakage current	Low	→	High
Interference	Low	→	High

F154 Automatic Voltage Rectification (AVR)	Setting range: 0: Invalid 1: Valid	Mfr's value: 0
F155 Digital accessorial frequency setting	Setting range: 0～F111	Mfr's value: 0
F156 Digital accessorial frequency polarity setting	Setting range: 0 or 1	Mfr's value: 0
F157 Reading accessorial frequency		
F158 Reading accessorial frequency polarity		
F159 Random carrier-wave frequency selection	Setting range: 0: Control speed normally; 1: Random carrier-wave frequency	Mfr's value: 1

When the function of automatic voltage rectification is valid, output voltage is enable to be kept contant automatically in the case of fluctuation of grid voltage.

If compound speed control mode of accessorial frequency is digital setting memory (F204=0), F155 and F156 are considered as initial set values of accessorial frequency and polarity (direction).

When accessorial frequency controls speed alone, polarity setting F156 is not valid.

In the mode of combined speed control, F157 and F158 are used for reading the value of accessorial frequency.

When F159=1 and random carrier-wave frequency is selected.

F160 Reverting to manufacturer values	Setting range: 0: Not reverting to manufacturer values; 1: Reverting to manufacturer values	Mfr's value: 0

· Set F160 to 1 when there is disorder with inverter's parameters and manufacturer values need to be restored. After "Reverting to manufacturer values" is done, F160 values will be automatically changed to 0.

· "Reverting to manufacturer values" will not work for the function-codes marked "o"in the "change" column of the parameters table. These function codes have been adjusted properly before delivery. And it is recommended not to change them.

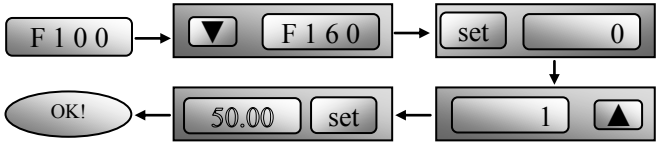


Figure 5-3 Reverting to manufacturer values

5.2 Operation Control

F200 Source of start command	Setting range: 0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3: MODBUS; 4: Keyboard＋Terminal＋MODBUS	Mfr‘s value: 0
F201 Source of stop command	Setting range: 0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3: MODBUS; 4: Keyboard＋Terminal＋MODBUS	Mfr‘s value: 0

· F200 and F201 are the resource of selecting inverter control commands.

· Inverter control commands include: starting, stopping, forward running and reverse running.

·”Keyboard command” refers to the start/stop commands given by the ―Run” or ”stop/reset” key on the keyboard.

·―Terminal command” refers to the start/stop command given by the ―Run” terminal defined by F316-F323.

·When F200=3 and F201=3, the running command is given by MODBUS communication.

·When F200=2 and F201=2, ―keypad command” and ―terminal command” are valid at the mean time, F200=4 and F201=4 are the same.

F202 Mode of direction setting	Setting range: 0: Forward running locking; 1: Reverse running locking; 2: Terminal setting	Mfr‘s value: 0

· The running direction is controlled by this function code together with other speed control mode which can set the running direction of inverter.

· When speed control mode without controlling direction is selected, the running direction of inverter is controlled by this function code, for example, keyboard controls speed.

· When speed control mode with controlling direction is selected, the running direction of inverter is controlled by both modes. The way is polarity addition, for example, one forward direction and one reverse direction make the inverter run reversely, both forward directions make inverter run forward, both reverse directions which equal to forward direction make inverter run forward.

· When mode of direction is set by terminals, the terminals are controlled by level signal.

F203 Main frequency source X	Setting range: 0: Memory of digital given; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4: Time period speed control; 5: No memory of digital given; 6: Keyboard potentiometer; 7: Reserved; 8: Reserved; 9: PID adjusting; 10: MODBUS	Mfr‘s value: 0

· Main frequency source is set by this function code.

·0: Memory of digital given

Its initial value is the value of F113. The frequency can be adjusted through the key ―up” or ―down”, or

through the ~~"up~~", ~~"d~~own" terminals.

~~"M~~emory of digital given" means after inverter stops, the target frequency is the running frequency before stop. If the user would like to save target frequency in memory when the power is disconnected, please set F220=1 to the function of memory for power disconnection.

1: External analog AI1; 2: External analog AI2
The frequency is set by analog input terminal AI1 and AI2. The analog signal may be current signal (0-20mA or 4-20mA) or voltage signal (0-5V or 0-10V), which can be chosen by switch code. Please adjust the switch code according to practical situations, refer to fig 4-4 and table 4-2.
When inverters leave the factory, the analog signal of AI1 channel is DC voltage signal, the range of voltage is 0-10V, and the analog signal of AI2 channel is DC current signal, the range of current is 0-20 mA. If 4-20mA current signal is needed, please set lower limit of analog input F406=1.
4: When time period speed control is valid, the numbers of time period is set by F561, the max time period number is 6. The speed of start and stop time period is set by F625~F630. The time of six time period is set by F562~F585. The accel/decel time time is set by F114 and F115.

5: No memory of digital given
Its initial value is the value of F113. The frequency can be adjusted through the key ~~"up~~" or ~~"d~~own", or through the ~~"up~~", ~~"d~~own" terminals.
~~"N~~o memory of digital given" means that the target frequency restores to the value of F113 after stop no matter the state of F220.

6: Keyboard Potentiometer
The frequency is set by the potentiometer on the control panel. Please choose the control panel with potentiometer.
7, 8: Reserved
9: PID adjusting

PID adjusting is selected. The running frequency of inverter is the value of frequency adjusted by PID. Please refer to instructions of PID parameters for PID given resource, PID given numbers, feedback source, and so on.

10: MODBUS

The main frequency is given by MODBUS communication.

F204 Accessorial frequency source Y	Setting range: 0: Memory of digital given; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4:Reserved; 5: PID adjusting; 6: Reserved	Mfr's value: 0

· When accessorial frequency Y is given to channel as single frequency, it has the same function with main frequency.

· When F204=0, the initial value of accessorial frequency is set by F155. When accessorial frequency controls speed alone, polarity setting F156 is not valid.

· When F207=1 or 3 and combined speed control is adopted and accessorial frequency is given by memory of digital F204=0, the initial value of accessorial frequency is set by F155, the polarity of accessorial frequency is set by F156, the initial value of accessorial frequency and the polarity of accessorial frequency can be checked by F157 and F158.

· When the accessorial frequency is given by analog input (AI1, AI2), the setting range for the accessorial frequency is confirmed by F205 and F206.

· Note: accessorial frequency source Y and main frequency source X can not use the same frequency given channel.

F205 Reference for selecting accessorial frequency source Y range	Setting range: 0: Relative to max frequency; 1: Relative to frequency X	Mfr's value: 1
F206 Accessorial frequency Y range	Setting range: 0～100％	Mfr's value: 100

· When combined speed control is adopted for frequency source, F206 is used to confirm the relative object of the setting range for the accessorial frequency.

The percentage of accessorial frequency range relative to relative object. If it is relative to main frequency, the range will change as main frequency changes.

F207 Frequency source selecting	Setting range: 0: X; 1: X+Y; 2: X or Y (by terminal switchover;); 3: X or X+Y (by terminal switchover); 4: Reserved. 5: X-Y 6: X+(Y-50%)	Mfr's value: 0

·Select the channel of setting the frequency. The frequency is given by combination of main frequency X and accessorial frequency Y.

·When F207＝0, the frequency is set by main frequency source.

·When F207＝1, the frequency is set by adding main frequency source to accessorial frequency source. If the frequency is set by main frequency source or accessorial frequency, PID speed control can not be selected.

·When F207＝2, main frequency source and accessorial frequency source can be switched over by frequency source switching terminal.

·When F207＝3, main frequency and adding frequency setting can be switched over by frequency source switching terminal.

·When F207＝4, this function is reserved.

·When F207=5, X-Y, the frequency is set by subtracting accessorial frequency source from main frequency source. If the frequency is set by main frequency or accessorial frequency, PID speed control can not be selected.

·When F207=6, X+(Y-50%), the frequency is given by both main frequency source and accessorial frequency source. X or Y can not be given by PID.

Note:

1. Frequency given mode can be switched over by selecting F207. For example: switching PID adjusting and normal speed control, switching keypad potentiometer stage speed and analog given, switching PID adjusting and analog given, and so on.
2. When F207=2 (main frequency source and accessorial frequency source can be switched over by terminals), if main frequency is not set to be under stage-speed control, accessorial frequency can be set to be under PID speed control (F204=5, F500=0).
3. If the settings of main frequency and accessorial frequency are the same, only main frequency will be valid.
4. When F207=6 and F205=0, then X+(Y-50)=X+(Y-50%*F111). When F207=6 and F205=1, then

X+(Y-50%)=X+(Y-50%*X).

5. Combination of Speed Control refers to table 5-1

Table 5-1 Combination of Speed Control

●: Intercombination is allowable. ○: Combination is not allowable.

F203 \ F204	0. Memory of digital setting	1 External analog AI1	2 External analog AI2	3 Reserved	4 Reserved	5 PID adjusting	6 Reserved
0 Memory of Digital setting	○	●	●	●	●	●	●
1 External analog AI1	●	○	●	●	●	●	●
2 External analog AI2	●	●	○	●	●	●	●
3 Reserved	●	●	●	○	○	●	○
4 Time period speed control	○	○	○	●	●	○	○
5 No memory of digital setting	○	○	○	●	●	○	○
6 Keyboard potentiometer	●	●	●	●	●	○	●
7. Reserved	●	●	●	○	○	●	○
8. Reserved	●	●	●	○	○	●	○
9 PID adjusting	●	●	●	●	●	○	●
10 MODBUS	●	●	●	●	●	●	●

F208 Terminal two-line/three-line operation control	Setting range: 0: other type; 1:two-line type 1; 2: two-line type 2; 3: three-line operation control 1; 4: three-line operation control 2; 5: start/stop controlled by direction impulse	Mfr's value: 0

· **When selecting two-line type or three-line type, F200, F201 and F202 are invalid.**

· **Five modes are available for terminal operation control.**

· "FWD", "REV" and "X" are three terminals designated in programming OP1～OP6.

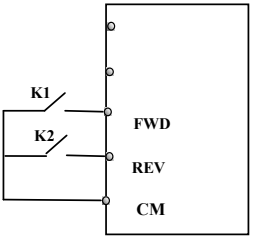
1: Two-line operation mode 1: this mode is the most often used two-line mode. The running direction of mode is controlled by FWD, REV terminals.

For example: "FWD" terminal-----open": stop, closed": forward running;

"REV" terminal-----open": stop, closed": reverse running;

"COM" terminal-----common port

K1	K2	Running command
0	0	Stop
1	0	Forward running
0	1	Reverse running
1	1	Stop



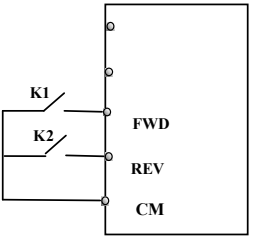
2. Two-line operation mode 2: when this mode is used, FWD is unable terminal, the direction is controlled by "FEV" terminal.

For example: "FWD" terminal------"open": stop, "closed": running;

"REV" terminal------"open": forward running, "closed": reverse running;

"CM" terminal-----common port

K1	K2	Running command
0	0	Stop
0	1	Stop
1	0	Forward running
1	1	Reverse running



3. Three-line operation mode 1:

In this mode, X terminal is unable terminal, the direction is controlled by FWD terminal and REV terminal.

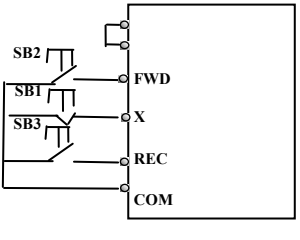
"X" terminal---- ("open": stop)

"FWD" terminal----- (forward command, "closed": forward running)

"REV" terminal----- (reverse command, "closed": reverse running)

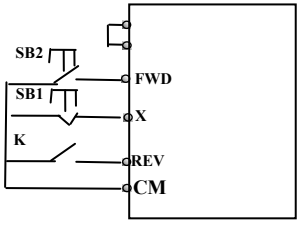
"CM" terminal----- common port

SB1: stop button, SB2: forward button, SB3: reverse button.



4. Three-line operation mode 2:

In this mode, X terminal is unable terminal, running command is controlled by FWD terminal. The running direction is controlled by REV terminal, and stopping command is controlled by X terminal.



–FWD" terminal---- (–closed": running)

–X" terminal----- (–open": stop)

–REV" terminal----- (forward /reverse running selection, –open", forward running, –closed": reverse running)

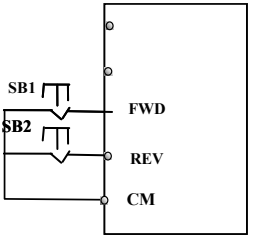
–CM" terminal----- common port

5. Start/stop controlled by direction impulse:

–FWD" terminal—(impulse start/stop signal: forward/stop)

–REV" terminal—(impulse start/stop signal: reverse/stop)

–CM" terminal—common port



Note: when pulse of SB1 triggers, inverter will run forward. When the pulse triggers again, inverter will stop running.

When pulse of SB2 triggers, inverter will run reverse. When the pulse triggers again, inverter will stop running.

F209 Selecting the mode of stopping the motor	Setting range: 0: stop by deceleration time; 1: free stop	Mfr's value: 0

When the stop signal is input, stopping mode is set by this function code:

F209=0: stop by deceleration time

Inverter will decrease output frequency according to setting acceleration/deceleration curve and time, after frequency decreases to 0, inverter will stop. This is often used stopping type.

F209=1: free stop

After stop command is valid, inverter will stop output. Motor will free stop by mechanical inertia.

If F201=1.2.4 (source of stop command includes terminal command) and F209=1 (free stop is selected), the mode of free stop is set by F700, the delay time is set by F701.

F210 Frequency display accuracy	Setting range: 0.01～2.00	Mfr's value: 0.01

Under keyboard speed control or terminal UP/DOWN speed control, frequency display accuracy is set by this function code and the range is from 0.01 to 2.00. For example, when F210=0.5, UP/DOWN terminal is pressed at one time, frequency will increase or decrease by 0.5Hz.

When inverter is in the standby state, no matter what value of this function code is, frequency will increase or decrease by 0.01Hz.

F211 Speed of digital speed control	Setting range: 0.01～100.0Hz/S	Mfr's value: 5.00

When UP/DOWN key in the keyboard or UP/DOWN terminal is pressed, frequency will change at the setting rate. The Mfr's value is 5.00Hz/s.

F213 Selfstarting after repowered on	Setting range: 0: invalid; 1: valid	Mfr's value: 0
F214 Selfstarting after reset	Setting range: 0: invalid; 1: valid	Mfr's value: 0

· F213 Set whether or not to start automatically after repowered on.

F213=1, Selfstarting after repowered on is valid. Inverter will run according to the running mode before power-down and it will run automatically after the time set by F215. If F220 frequency memory after power-down is not valid, inverter will run by the setting value of F113.

F213=0, after repower-on, inverter will not run automatically unless running command is given to inverter.

· F214 Set whether or not to start automatically after fault resetting.

When F214=1, after malfunction occurs, inverter will reset automatically after delay time for fault reset. After resetting, inverter will run automatically after the selfstarting delay time.

If frequency memory after power-down is valid, inverter will run at the speed before power-down. Otherwise, inverter will run at the speed set by F113.

In case of fault under running status, inverter will reset automatically and self-start. In case of fault under stopped status, the inverter will only reset automatically.

When F214=0, after malfunction occurs, inverter will display fault code, it must be reset by hand.

F215 Selfstarting delay time	Setting range: 0.1～3000.0	Mfr's value: 60.0

F215 is the seftstarting delay time for F213 selfstarting after repower on and F214 selfstarting after malfunction reset. The range is from 0.1s to 3000.0s.

F216 Times of selfstarting in case of repeated faults	Setting range: 0～5	Mfr's value: 0
F217 Delay time for fault reset	Setting range: 0.0～10.0	Mfr's value: 3.0

F216 sets the most times of selfstarting in case of repeated faults. If starting times are more than the setting value of this function code, inverter will not reset or start automatically after malfunction. Inverter will run after running command is given to inverter by hand.
F217 sets delay time for fault reset. The range is from 0.0 to 10.0S which is time interval from malfunction to resetting.

F220 Frequency memory after power-down	Setting range: 0: invalid; 1: valid	Mfr's value: 0

F220 sets whether or not frequency memory after power-down is valid.

This function is valid for F213 and F214. This function sets whether or not to memory running state after power-down or malfunction.

·The function of frequency memory after power-down is only valid for digital set main frequency and accessorial frequency. Because the digital given accessorial frequency has positive polarity and negative polarity, it is saved in the function codes F155 and F156.

5.3. Multifunctional Input and Output Terminals

5.3.1 Multifunctional output terminals

F300 Relay token output	Setting range: 0~20 Refer to table 5-2 for detailed instructions.	Mfr's value: 1
F301 DO1 token output		Mfr's value: 21
F302 DO2 token output		Mfr's value: 0

F2000-P inverter has one multifunctional relay output terminal and two multifunctional digital output terminals.

Instructions for digital multifunctional output terminal

Value	Function	Instructions
0	no function	Output terminal has no functions.
1	inverter fault protection	When inverter works wrong, ON signal is output.
2	over latent frequency 1	Please refer to instructions from F307 to F309.
3	over latent frequency 2	Please refer to instructions from F308 and F309.
4	free stop	When terminal free stop command is given and stop signal is given, signal "ON" is output till inverter stops totally.
5	inverter is running 1	Indicating that inverter is running and ON signal is output.
6	DC braking	Indicating that inverter is in the status of DC braking and ON signal is output.
7	acceleration/deceleration time switchover	Indicating that inverter is in the status of acceleration/deceleration time switchover
8	reserved	
9	reserved	
10	inverter overload pre-alarm	After inverter overload, ON signal is output after the half time of protection timed, ON signal stops outputting after overload stops or overload protection occurs.
11	motor overload pre-alarm	After load overload, ON signal is output after the half time of protection timed, ON signal stops outputting after overload stops or overload protection occurs.
12	stalling	During acceleration/deceleration process, inverter stops accelerating/decelerating because inverter is stalling, and ON signal is output.
13	Line disconnection protection	Indicating inverter detects feedback input lines disconnection, and ON signal is output. After line disconnection protection disappears, OFF signal is output.
14	Lack water alarm	Indicating inverter detects lack water signal, and ON signal is output. After lack water alarm disappears, OFF signal is output.
15	frequency arrival output	Indicating inverter runs to the setting target frequency, and ON signal is output. See F312.
16	overheat pre-alarm	When testing temperature reaches 80% of setting value, ON signal is output. When overheat protection occurs or testing value is lower than 80%of setting value, ON signal stops outputting.
17	over latent current output	When output current of inverter reaches the setting overlatent current, ON signal is output. See F309 and F310.
18	Starting Linefrequency Pump	Indicating some linefrequency pumps are working, and ON signal is output. If none of linefrequency pump is working, OFF signal is output.
19	Inverter is ready	Indicating inverter is in the proper state and it will work if it receives running order, and ON signal is output. Or else, OFF signal will be output.

20	Starting frequency-conversion pump	Indicating some frequency-conversion pumps are working, and ON signal is output. If none of frequency-conversion pump is working, OFF signal is output.
21	inverter is running 2	Indicating that inverter is running and ON signal is output.
22	Over-limit pressure token	When PID adjusting is valid and negative feedback is selected, and feedback pressure is higher than max pressure set by F503, ON signal is output, orelse OFF signal is output.

F307 Characteristic frequency 1	Setting range: F112～F111Hz	Mfr's value: 10Hz
F308 Characteristic frequency 2		Mfr's value: 50Hz
F309 Characteristic frequency width	Setting range: 0～100%	Mfr's value: 50

When F300=2, 3 and F301=2, 3 and F303=2, 3 and token characteristic frequency is selected, this group function codes set characteristic frequency and its width. For example: setting F301=2, F307=40, F309=10, DO1 terminal stands for characteristic frequency 1, when frequency changes between from（40-40*10%）to（40+40*10%）Hz, ON signal is output by DO1 terminal.

F310 Characteristic current	Setting range: 2000A	Mfr's value: Rated current
F311 Characteristic current hysteresis loop width	Setting range: 0～100%	Mfr's value: 10

When F300=17 and F301=17 and F302=17 and token characteristic current is selected, this group function codes set characteristic current and its width.

For example: setting F301=17, F310=100, F311=10, DO1 terminal stands for characteristic current, when output current changes between from （100-100*10%），（100+100*10%）A, signal "ON" is output by DO1 terminal.

F312 Frequency arrival threshold	Setting range: 0.00～5.00Hz	Mfr's value: 0.00

When F300=15 and F301=15 and F302=15, threshold range is set by F312.

For example: when F301=15, target frequency is 20HZ and F312=2.00, the running frequency reaches 18HZ (20-2), signal "ON" is output by DO1 until the running frequency reaches target frequency.

5.3.2 Multifunctional input terminals

F2000 series inverter has 6 multifunctional input terminals.

F316 OP1 terminal function setting	Setting range: 0: no function; 1: running terminal; 2: stop terminal; 3: Lack water signal; 4: Signal of water; 5: Reserved; 6: Reserved; 7: reset terminal; 8: free stop terminal; 9: external emergency stop terminal; 10: acceleration/deceleration forbidden terminal; 11: forward run jogging; 12: reverse run jogging; 13: UP frequency increasing terminal; 14: DOWN frequency decreasing terminal; 15: "FWD" terminal; 16: "REV" terminal; 17: three-line type input "X" terminal;	Mfr's value: 11
F317 OP2 terminal function setting		Mfr's value: 3
F318 OP3 terminal function setting		Mfr's value: 4
F319 OP4 terminal function setting		Mfr's value: 16
F320 OP5 terminal function setting		Mfr's value: 8

F321 OP6 terminal function setting	18: acceleration/deceleration time switchover terminal; 19~20: Reserved; 21: frequency source switchover terminal; 22～30: Reserved	Mfr's value: 15

·This parameter is used for setting the corresponding function for multifunctional digital input terminal.

·Both free stop and external emergency stop of the terminal have the highest priority.

Instructions for digital multifunctional input terminals

Value	Function	Instructions
0	No function	Even if signal is input, inverter will not work. This function can be set by undefined terminal to prevent mistake action.
1	Running terminal	When running command is given by terminal or terminals combination and this terminal is valid, inverter will run. This terminal has the same function with "run" key in keyboard.
2	Stop terminal	When stop command is given by terminal or terminals combination and this terminal is valid, inverter will stop. This terminal has the same function with "stop" key in keyboard. When F209=1 and free stop command is selected, this terminal is valid. The mode of free stop is set by F700, and the delay time of free stop is set by F701. Please refer to instructions of F700 and F701.
3	Lack water signal	When F526=1 and OP terminal is set to 3, this function is valid. While lack of water, inverter will be in the protection state.
4	Signal of water	When F526=1, this function is valid. If water is enough, inverter will reset automatically.
5	Reserved	
6	Reserved	
7	Reset terminal	This terminal has the same function with "reset" key in keyboard. Long-distance malfunction reset can be realized by this function. (In PID protection, it only means stopping status.)
8	Free stop terminal	Inverter closes off output and motor stop process is not controlled by inverter. This mode is often used when load has big inertia or there are no requirements for stop time. This mode has the same function with free stop of F209.
9	External emergency stop terminal	When external malfunction signal is given to inverter, malfunction will occur and inverter will stop.
10	Acceleration/deceleration forbidden terminal	Inverter will not be controlled by external signal (except for stop command), and it will run at the current output frequency.
11	forward run jogging	Forward jogging running and reverse jogging running. Refer to F124, F125 and F126 for jogging running frequency, jogging acceleration/deceleration time.
12	reverse run jogging	
13	UP frequency increasing terminal	When frequency source is set by digital given, the setting frequency can be adjusted which rate is set by F211.
14	DOWN frequency decreasing terminal	
15	"FWD" terminal	When start/stop command is given by terminal or terminals combination, running direction of inverter is controlled by external terminals.
16	"REV" terminal	

17	Three-line input "X" terminal	"FWD"、"REV"、"COM" terminals realize three-line control. See F208 for details.
18	acceleration/deceleration time switchover terminal	When this function is selected, second acceleration/deceleration time is valid. See F116 and F117 for the second acceleration/deceleration time.
19	Reserved	Reserved
20	Reserved	Reserved
21	frequency source switchover terminal	When F207=2, main frequency source and accessorial frequency source can be switched over by frequency source switching terminal. When F207=3, main frequency and adding frequency setting can be switched over by frequency source switching terminal.
22-30	Reserved	Reserved

F324 Free stop terminal logic	Setting range: 0: positive logic (valid for low level); 1: negative logic (valid for high level)	Mfr's value: 0
F325 External emergency stop terminal logic		Mfr's value: 0

When multi-stage speed terminal is set to free stop terminal and external emergency stop terminal, terminal logic level is set by this group of function codes.

When F324=0 and F325=0 and positive logic is selected, low level is valid. And F324=1 and F325=1 and negative logic is selected, high level is valid.

5.4 Analog Input and Output

F2000-P series inverters have 2 analog input channels and 2 analog output channels. AI3 input channel is inside input channel of potentiometer in the panel.

F400 Lower limit of AI1 channel input	Setting range: 0.00～F402	Mfr's value: 0.01V
F401 Corresponding setting for lower limit of AI1 input	Setting range: 0～F403	Mfr's value: 1.00
F402 Upper limit of AI1 channel input	Setting range: F400～10.00V	Mfr's value: 10.00V
F403 Corresponding setting for upper limit of AI1 input	Setting range: Max (1.00，F401) ～2.00	Mfr's value: 2.00
F404 AI1 channel proportional gain K1	Setting range: 0.0～10.0	Mfr's value: 1.0
F405 AI1 filtering time constant	Setting range: 0.00～10.00	Mfr's value: 0.10

·In the mode of analog speed control, sometimes it requires adjusting coincidence relation among upper limit and lower limit of input analog, analog changes and output frequency, to achieve a satisfactory speed control effect.

· Upper and lower limit of analog input are set by F400 and F402.

For example: when F400=1, F402=9, if analog input voltage is lower than 1V, system judges it as 0. If input voltage is higher than 9V, system judges it as 10V (Suppose analog channel selects 0-10V). If Max frequency F111 is set to 50Hz, the output frequency corresponding to 1-9V is 0-50Hz.

· The filtering time constant is set by F405.

The greater the filtering time constant is, the more stable for the analog testing. However, the precision may

decrease to a certain extent. It may require appropriate adjustment according to actual application.
· Channel proportional gain is set by F404.
If 1V corresponds to 10Hz and F404=2, then 1V will correspond to 20Hz.
· Corresponding setting for upper / lower limit of analog input are set by F401 and F403.

If Max frequency F111 is 50Hz, analog input voltage 0-10V can correspond to output frequency -50Hz—50Hz by setting this group function codes. Please set F401=0 and F403=2, then 0V corresponds to -50Hz, 5V corresponds to 0Hz and 10V corresponds to 50Hz. The unit of corresponding setting for upper / lower limit of input is in percentage (%). If the value is greater than 1.00, it is positive; if the value is less than 1.00, it is negative. (e.g. F401=0.5 represents –50%).
If the running direction is set to forward running by F202, then 0-5Hz corresponding to the minus frequency runs reverse, or vice versa.
The opposite corresponding relation between analog and frequency setting: if F401 and F403 are set to between the range of 1.00≤F403<F401≤2.00, the corresponding relation between analog and frequency is opposite. For example: when F111=50, F401=1.90 and F403=1.20, and analog input 0V corresponds to (F401-1)×100%×50Hz=45Hz, 10V corresponds to (F403-1)×100%×50Hz=10Hz. It means analog 0-10V corresponds to 45HZ-10HZ.

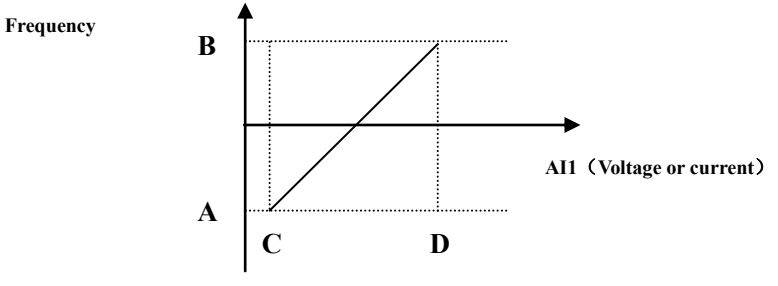


Fig 5-6 F400～F403 setting instructions

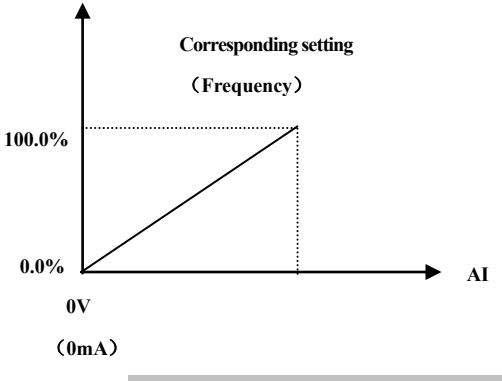


Fig 5-7 correspondence of analog input to setting

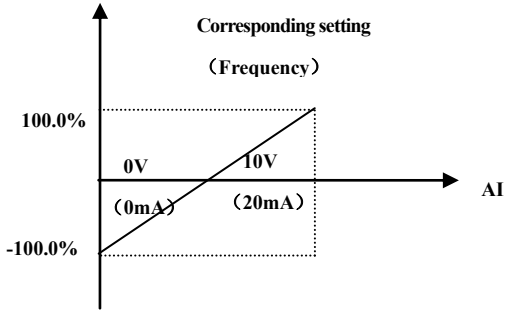


Fig 5-8 correspondence of analog input to setting

The corresponding setting benchmark: in the mode of joint speed control, analog is the accessorial frequency and the setting benchmark for range of accessorial frequency which relatives to main frequency is ~~-m~~ain frequency X"; corresponding setting benchmark for other cases is the ~~-m~~ax frequency", as illustrated in the right figure:

A= **(F401-1)* setting value**

B= **(F403-1)* setting value**

C= **F400**

D= **F402**

F406 Lower limit of AI2 channel input	Setting range: 0.00～F408	Mfr's value: 0.01V
F407 Corresponding setting for lower limit of AI2 input	Setting range: 0～F409	Mfr's value: 1.00
F408 Upper limit of AI2 channel input	Setting range: F406～5.00V	Mfr's value: 10.00V
F409 Corresponding setting for upper limit of AI2 input	Setting range: Max (1.00，F407) ～2.00	Mfr's value: 2.00
F410 AI2 channel proportional gain K2	Setting range: 0.0～10.0	Mfr's value: 1.0
F411 AI2 filtering time constant	Setting range: 0.1～10.0	Mfr's value: 0.10
F412 Lower limit of AI3 channel input	Setting range: 0.00～F414	Mfr's value: 0.10V
F413 Corresponding setting for lower limit of AI3 input	Setting range: 0～F415	Mfr's value: 1.00
F414 Upper limit of AI3 channel input	Setting range: F412～5.0V	Mfr's value: 5.0V
F415 Corresponding setting for upper limit of AI3 input	Setting range: Max (1.00，F413) ～2.00	Mfr's value: 2.00
F416 AI3 channel proportional gain K1	Setting range: 0.0～10.0	Mfr's value: 1.0
F417 AI3 filtering time constant	Setting range: 0.1～10.0	Mfr's value: 5.0

The function of AI2 and AI3 is the same with AI1.

F418 AI1 channel 0Hz voltage dead zone	Setting range: 0～0.50V (Positive-Negative)	Mfr's value: 0.00
F419 AI2 channel 0Hz voltage dead zone	Setting range: 0～0.50V (Positive-Negative)	Mfr's value: 0.00
F420 AI3 channel 0Hz voltage dead zone	Setting range: 0～0.50V (Positive-Negative)	Mfr's value: 0.00

Analog input voltage 0-10V can correspond to output frequency -50Hz—50Hz (5V corresponds to 0Hz) by setting the function of corresponding setting for upper / lower limit of analog input. The group function codes of F418, F419 and F420 set the voltage range corresponding to 0Hz. For example, when F418=0.5, F419=0.5 and F420=0.5, the voltage range from (5-0.5=4.5) to (5+0.5=5.5) corresponds to 0Hz. So if F418=N, F419=N and F420=N, then 5±N should correspond to 0Hz. If the voltage is in this range, inverter will output 0Hz.

F2000-P series inverters have two analog output channels.

F423 AO1 output range selecting	Setting range: 0: 0～5V; 1: 0～10V or 0~20mA 2: 4~20mA	Mfr's value: 1
F424 Corresponding frequency for lowest voltage of AO1 output	Setting range: 0.0～F425	Mfr's value: 0.05Hz
F425 Corresponding frequency for highest voltage of AO1 output	Setting range: F425～F111	Mfr's value: 50.00Hz
F426 AO1 output compensation	Setting range: 0～120%	Mfr's value: 100

· AO1 output range is selected by F423. When F423=0, AO1 output range selects 0~5V, and when F423=1, AO1 output range selects 0~10V.

· Correspondence of output voltage range (0-5V or 0-10V) to output frequency is set by F424 and F425. For example, when F423=5, F424=10 and F425=60, analog channel AO1 outputs 0-5V and the output frequency is 10-60Hz.

· AO1 output compensation is set by F426. Analog excursion can be compensated by setting F426.

F427 AO2 output range	Setting range: 0: 0～20mA; 1: 4～20 mA	Mfr's value: 0
F428 AO2 lowest corresponding frequency	Setting range: 0.0～F429	Mfr's value: 0.05Hz
F429 AO2 highest corresponding frequency	Setting range: F428～F111	Mfr's value: 50.00
F430 AO2 output compensation	Setting range: 0～120%	Mfr's value: 100

The function of AO2 is the same as AO1, but AO2 will output current signal, current signal of 0-20mA and 4-20mA could be selected by F427.

F431 AO1 analog output signal selecting	Setting range: 0: Running frequency; 1: Output current; 2: Output voltage; 3～5: Reserved 6: Output motor power	Mfr's value: 0
F432 AO2 analog output signal selecting		Mfr's value: 1

· Token contents output by analog channel are selected by F431 and F432. Token contents include running frequency, output current and output voltage.

· When output current is selected, analog output signal is from 0 to twofold rated current.

· When output voltage is selected, analog output signal is from 0V to rated output voltage (230V or 400V).

· When output power is selected, analog output signal is from 0 to twofold motor rated power;

F433 Corresponding current for full range of external voltmeter	Setting range: 0.01～5.00 times of rated	Mfr's value: 2.00

F434 Corresponding current for full range of external ammeter	current	Mfr‘s value: 2.00

· In case of F431=1 and AO1 channel for token current, F433 is the ratio of measurement range of external voltage type ammeter to rated current of the inverter.

· In case of F432=1 and AO2 channel for token current, F434 is the ratio of measurement range of external current type ammeter to rated current of the inverter.

For example: measurement range of external ammeter is 20A, and rated current of the inverter is 8A, then, F433=20/8=2.50.

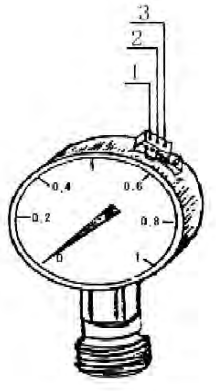
5.5. PID parameters

5.5.1 Internal PID adjusting and constant pressure water supply

Internal PID adjusting control is used for single pump or double pump automatic constant-pressure water supply, or used for simple close-loop system with convenient operation.

The usage of pressure meter:

The wiring diagram of long distance connection between pressure meter and inverter‘s terminal:



Note: The pressure signal input channel should be same as the setting of F502, but should be different with the setting of F501.

As F502=1: channel AN1

“+10V” connect with the port 1 of pressure meter (power supply)

“AN1” connect with the port 2 of pressure meter (pressure signal)

“GND” connect with the port 3 of pressure meter (ground)

As F502=2: channel AN2

“+10V” connect with the port 1 of pressure meter (power supply)

“AN2” connect with the port 2 of pressure meter (pressure signal)

“GND” connect with the port 3 of pressure meter (ground)

For current type sensor, two-line 4-20mA signal is inputed to inverter, please connect CM to GND, and 24V is connected to power supply of sensor and 4-20 mA is connected to AN1 or AN2.

5.5.2 Parameters

F500 PID working mode	Setting range: 0: Single pump 1: Fixed mode 2: Timing interchanging 3: Frequency-conversion Circulating 4: Frequency-conversion pumps do not restart.	Mfr‘s value: 0

When F500=0 and single pump mode is selected, the inverter only controls one pump. And extension board is no need to add to the inverter. Please set F536~F538 to open the relay in the control PCB and please set F547~F549 correctly to start the corresponding reply in sequence.

When F500=1, one motor is connected with frequency-conversion pump all the time. When the other pumps (no more than 7 pumps) are connected with linefrequency pump, this function should be selected.

When F500=2, two or more pumps (no more than 4 pumps) are interchanging to connect with inverter for a fixed period of time, this function should be selected.

When F500=3, two or more pumps (no more than 4 pumps) are all connected with inverter, but they are used alternately, this function is valid.

When F500=4 and F203=9 or F204=5, F500=4, linefrequency pumps can be started, but frequency-conversion can not be changed.

F501 PID adjusting target given source	Setting range: 0~4	Mfr's value: 0

When F501=0, PID adjusting target is given by keypad.

When F501=1, PID adjusting target is given by external analog AI1.

When F501=2, PID adjusting target is given by external analog AI2.

When F501=3, PID adjusting target is given by the potentiometer on the keypad.

When F501=4, PID adjusting target is given by MODBUS.

F502 PID adjusting feedback given source	Setting range: 1~2	Mfr's value: 1

When F502=1, PID adjusting feedback signal is given by external analog AI1.

When F502=2, PID adjusting feedback signal is given by external analog AI2.

F503	Max limit of PID adjusting	10.0～100.0%	Mfr's value：90.0
F504	Digital setting value of PID adjusting	10.0～100.0%	Mfr's value：70.0
F505	Min limit of PID adjusting	0.0～100.0%	Mfr's value：5.0

When negative feedback adjusting is valid, if pressure is higher than Max limit of PID adjusting, pressure protection will occur. If inverter is running, it will free stop, and "~~-~~NP" is displayed. When positive feedback adjusting is valid, if pressure is higher than Max limit, it indicates that feedback pressure is too low, inverter should accelerate or a linefrequency should be added to increase the displacement.

When F501=0, the value set by F504 is digital setting reference value of PID adjusting.

When positive feedback adjusting is valid, if pressure is higher than Min limit of PID adjusting, pressure protection will occur. If inverter is running, it will free stop, and "~~-~~NP" is displayed. When negative feedback adjusting, if pressure is higher than Min limit, it indicates that feedback pressure is too low, inverter should accelerate or a linefrequency should be added to increase the displacement.

For example: if the range of pressure meter is 0-1.6MPa, then settimg pressure is 1.6*70%=1.12MPa, and the max limit pressure is 1.6*90%=1.44MPa, and the min limit pressure is 1.6*5%=0.08MPa.

F506	PID polarity	0: Negative feedback 1: Positive feedback	Mfr's value：1

When F506=0, the lower the feedback value is, the higher the motor speed is. This is negative feedback.

When F506=1, the higher the feedback value is, the higher the motor speed is. This is positive feedback.

F507	The running status while inverter is controlled by PID and it runs to Min frequency	0：Stopping after delay time 1：Running at Min frequency	Mfr's value：0

When F507=0 and PID adjusting, if inverter runs to Min frequency, inverter will stop after the delay time set by F510.

When F507=1 and PID adjusting, if inverter runs to Min frequency, inverter will keep running at the Min frequency.

F508	The sequence of stopping linefrequency	0：First started, first stopped 1：First started, stopped later	Mfr's value：0

When some linefrequency pumps are working at the same time, the sequence of stopping these linefrequency pumps is set by F508.

When F508=0, the sequence is first started, first stopped. When F508=1, the sequence is opposite. For example: if frequency-conversion pump is No.1 and the sequence of starting the linefrequency pumps is No 1,2,8,6, when F508=0, the sequence of stopping the linefrequency pumps is also No 1,2,8,6; when F508=1, the sequence of stopping the linefrequency pumps is No. 6,8,2,1.

F509	Min frequency of PID adjusting	F112～f111	Mfr's value：15.00

Inverter can run to the Min frequency by PID adjusting.

F510	Sleep waiting time after inverter runs to Min frequency by PID adjusting.	0.0～500.0s	Mfr‘s value：15.0

When F507=0 and inverter runs to the Min frequency by PID adjusting, inverter will free stop and turn into protection status after the waiting time set by F510.

F515	Feedback line disconnection protection	0: Invalid 1: Valid	Mfr‘s value：0
F516	Feedback line disconnection protection value	0.0～100.0%	Mfr‘s value: 1.0
F517	Checking time of feedback line disconnection	1．0～10.0	Mfr‘s value: 5.0

When F515=0, line disconnection protection is invalid. When F515=1, line disconnection protection is valid.

If feedback value is lower than line disconnection protection value set by F516, inverter will enter status of checking time for feedback line disconnection.

If the time of line disconnection exceeds the checking time set by F517, inverter will keep protection status.

For example: when F515=1, F516=10.0 and F517=5.0, if PID feedback is less than 10.0, inverter will stop all linefrequency pump and frequency-conversion pumps after 5 seconds. Then inverter will free stop and keep protection status, and “PP” is displayed in the keypad.

F518	Whether PID adjusting target is changed (Memory after power-down）	0: Invalid 1: Valid	Mfr‘s value: 1

When F518=0, PID adjusting target can not be changed. The value should equal the setting value when F518=1 or sample value of analog feedback after resetting.

The adjusting method of water supply is defined as “PID adjusting”. It has a little difference with practical PID adjusting. This arithmetic is a better adjusting method for F2000-P series inverter.

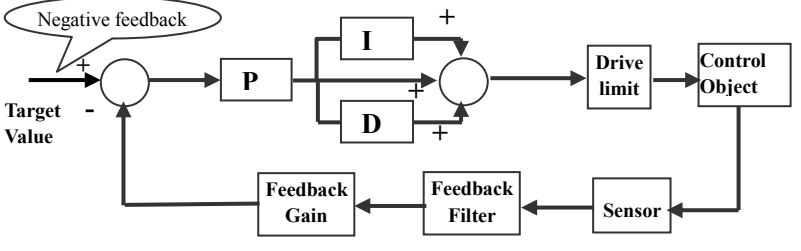
F519	Proportion Gain P	0.00~10.00	Mfr‘s value: 0.3
F520	Integration Gain I	0.0~100.0S	Mfr‘s value: 0.3
F521	Differential time D	0.00~10.00	Mfr‘s value: 0.0
F522	PID sampling cycle	0.1～10.0s	Mfr‘s value: 0.1

Proportion gain of adjustor is set by F519. When proportion gain is different with feedback value, the bigger proportion gain is, the greater the influence to output rotatory speed is.

Integral adjustor is different with former PID adjusting. It can restrain surge because frequency changes rapidly when PID adjusting. The bigger integration gain is, the slower the system responds; the smaller integration gain is, the faster the system responds. Contrariwise with Proportion Gain.

PID adjusting cycle is set by F522. It affects PID adjusting speed.

The following is PID adjusting arithmetic.



F524	Switching Timing unit setting	Setting range: 0: hour 1: minute	Mfr's value: 0
F525	Switching Timing Setting	1～9999	Mfr's value: 100

Switching time is set by F525. The unit is set by F524.

F526	Lack Water Protection Mode	Setting Range 0: No protection 1: Protection with sensor 2: Protection without sensor	Mfr's value: 0
F527	Lack water protection current (%)	10～150%	Mfr's value: 80

When F526=1, water signal and lack water signal are separately controlled by two terminals.

When F526=2 and inverter runs to Max frequency by PID adjusting, if sampling current of inverter is lower than the product of the setting value of F527 and rated current, inverter will enter the protection status without sensor, and EP is displayed in the keypad.

F528	Waking starting interval after protection	0.0～300.0s	Mfr's value: 0.0

This function avoids inverter starting repeatedly in some situations. If pressure (or water lack) protection occurs, after the setting time of F528, inverter will judge whether the protection signal disappears. During protection period, if users press the "Run" key, inverter will cancel waking starting interval, but protection signal can not be canceled. Inverter will be ready in the status of water supplying. After the setting time of F528, inverter will begin running at once if protection signal disappears, or else inverter will not start until protection signal disappears.

Note: If feedback pressure is lower than Min pressure, inverter will begin running after the delay time of F528. (Feedback polarity is different, the Min feedback of positive feedback is set by F503 and the Min feedback of negative feedback is set by F505.)

F529	Pressure dead time when starting and stopping linefrequency pumps by PID adjusting	0.0～10.0%	Mfr's value: 2.0
F530	Running Interval of Frequency-conversion pump after starting linefrequency pumps or interchange time is over	2.0～999.9s	Mfr's value: 4.0
F531	Delay time of starting linefrequency pumps	0.1～999.9s	Mfr's value: 3.0
F532	Delay time of stopping linefrequency pumps	0.1～999.9s	Mfr's value: 3.0

F529, PID dead time has two functions. First, setting dead time can restrain PID adjustor oscillation. The greater this value is, the lighter PID adjustor oscillation is. But if the value of F529 is too high, PID adjusting precision will decrease. For example: when F529=2.0% and F504=70, PID adjusting will not invalid during the feedback value from 68 to 72.

Second, F529 is set to pressure dead time when starting and stopping linefrequency pumps by PID adjusting. When negative feedback adjusting is valid, if feedback value is higher than value F504+F529 (which equal to set value PLUS dead-time value), inverter will delay the set time of F531, and then start the linefrequency pump.When positive feedback adjusting is valid if feedback value is lower than value F504-F529 (which equal to set value MINUS dead-time value), inverter will delay the set time of F531, and then start the linefrequency pump.

· When starting linefrequency pump or interchange time is over, inverter will free stop. After starting linefrequency pump, inverter will delay the set time of F530, and restart frequency-conversion pump.

· When inverter drives several pumps and negative feedback adjusting, if the frequency already reach the Max value and after the delay time (F531), the pressure value is still lower than the value (which equal to set value PLUS dead-time value), then the inverter will stop output immediately and motor will freely stop. At the same

time, the linefrequency pump will be started. After the linefrequency pump is fully run, if the present pressure is higher than the set value, inverter will low down the output to the Min frequency, delay the set time (F532) and free stop.

· When inverter drives several pumps and positive feedback adjusting, if the frequency already reach the Max value and after the delay time (F531), the pressure value still higher than the value(which equal to set value MINUS dead-time value), then the inverter will stop output immediately and motor will freely stop. At the same time the linefrequency pump will be started. After the linefrequency pump running, if the present pressure is lower than the set value, low down the output to the Min frequency, delay the set time (F532), and free stop.

F535 Checking the number of working pumps		

When inverter drives several pumps, users can check the number of working pumps by F535. So users can check whether the parameters are set correctly by checking the value of F535. For example, if five relays need be started, but the value of F535 is 4, it indicates one relay is set wrong

Note: when one inverter drives n pumps (n＜＝8) and timing interchanging and frequency-conversion interchanging is valid, the numbers of working reply must be even numbers according to the rule of connection wiring. If users set the numbers of working pumps to odd numbers, inverter will detect this malfunction and "ERR3" is displayed in the keypad. If n=2 and some pumps are interchanging to supply the water, please refer to two relays on the right side of Fig 1 and Fig 2 of F2000-P periphery wiring.

If n≥4, interchanging control can realize by adding an extension board. The rule is that odd-numbered relay controls frequency-conversion pumps and even-numbered relay controls linefrequency pumps. Please refer to the figure of F2000-P periphery wiring.

F536	Whether No.1 reply is started	0: Stopped 1: Started	Mfr's value: 0
F537	Whether No.2 reply is started	0: Stopped 1: Started	Mfr's value: 0
F538	Whether No.3 reply is started	0: Stopped 1: Started	Mfr's value: 0
F539	Whether No.4 reply is started	0: Stopped 1: Started	Mfr's value: 0
F540	Whether No.5 reply is started	0: Stopped 1: Started	Mfr's value: 0
F541	Whether No.6 reply is started	0: Stopped 1: Started	Mfr's value: 0
F542	Whether No.7 reply is started	0: Stopped 1: Started	Mfr's value: 0
F543	Whether No.8 reply is started	0: Stopped 1: Started	Mfr's value: 0
F544	Whether No.9 reply is started	0: Stopped 1: Started	Mfr's value: 0
F545	Whether No.10 reply is started	0: Stopped 1: Started	Mfr's value: 0
F546	Whether No.11 reply is started	0: Stopped 1: Started	Mfr's value: 0

No 1 relay corresponds to the terminal DO1 in the control PCB, No 2 relay corresponds to the terminalDO2 in the control PCB, No 3 relay corresponds to the terminal TA/TC in the control PCB, and No 4~ NO 11 relays correspond to 8 terminals "RY1~RY8" in the extension board. The common port of DO1 and DO2 is "CM". The common port of "RY1~RY4" is "COM1", and the common port of "RY5~RY8" is "COM2".

Note: if users want to use the function of F300~F302, please set the corresponding parameters F539~F546 to "0".

F547	The sequence of starting No 1 relay	1～20	Mfr's value: 20
F548	The sequence of starting No 2 relay	1～20	Mfr's value: 20
F549	The sequence of starting No 3 relay	1～20	Mfr's value: 20
F550	The sequence of starting No 4 relay	1～20	Mfr's value: 20
F551	The sequence of starting No 5 relay	1～20	Mfr's value: 20
F552	The sequence of starting No 6 relay	1～20	Mfr's value: 20
F553	The sequence of starting No 7 relay	1～20	Mfr's value: 20
F554	The sequence of starting No 8 relay	1～20	Mfr's value: 20

F555	The sequence of starting No 9 relay	1～20	Mfr‘s value: 20
F556	The sequence of starting No 10 relay	1～20	Mfr‘s value: 20
F557	The sequence of starting No 11 relay	1～20	Mfr‘s value: 20

The sequence of starting relays is set by F547~F557. Only No 4~11 relays are effective, and the setting value of F547~F557 must be different with each other, or else “ERR3” is displayed in the keypad.

F560	Period of Time Control	0: Null 1: time period control 2: dividing time period control	Mfr‘s value: 0
F561	Period of Time Number	1～303	Mfr‘s value: 1

·When F560=1 or 2, period of time control is valid. The period of time control number is set by F561.

When F560=0, period of time control is invalid.

When F560=1, inveter can realize 6 periods of time control. The setting range of F561 is 1~6. The setting value is valid within one year.

When F560=2, inverter can realize dividing time period control. It divides into two periods of time control, and each period of time control can divided into 3 time periods, so the setting range of F561 is 101-303. The time period 1 (CH1) setting range is F616/F617～F618/F619 and time period parameters are from F562 to F573. The time period 2 (CH2) setting range is F618/F619～F616/F617 and time period parameters are from F574 to F585.

Digital display	LED3	LED2	LED1	LED0
Dividing time period control	CH2		CH1	

For example:

1. If water is supplied 5 times each day all year, please set F560=1, F561=5 and set the value of F562~F581 accordingly.
2. If water is supplied 3 times each day from 1st, May to 30th, Oct all year and twice from 1st, Dec to 30th, Apr, CH1 should be set to 3 and CH2 should be set to 2, it means F560=2, F561=203, F616=5，F617=1, F618=11，F619=30 and set the value of F562-F573, F574-F585 accordingly.

NOTE:

1. When F560=2, F615 and F203=4 is invalid.
2. When the value of F560 is changed from 2 to 1 or 0, the value of F561 will change to 1 automatically.
3. When the value of F560 is changed from 0 or 1 to 2, the value of F561 will change to 303 (CH1=3 and CH2=3) automatically. User must change the value of F561 manually if it is necessary.
4. When F560=1 or 0, the setting range of F561 is from 1 to 6 (or else, Err1 will dispaly). When F560=2, the setting range of CH1 is from 1 to 3 and the setting range of CH2 is from 1 to 3. (Or else, Err1 will dispaly).
5. Each time period must not overlap each other. For example: period of time 1 running time is 1:30~8:30, but period of time 2 stopping time must not 4:00~12:00.

F562 Period of Time 1 Starting Hour	Setting Range: 0～23	Mfr Value: 6
F563 Period of Time 1 Starting Minute	Setting Range: 0～59	Mfr Value: 30
F564 Period of Time 1 Stopping Hour	Setting Range: 0～23	Mfr Value: 8
F565 Period of Time 1 Stopping Minute	Setting Range: 0～59	Mfr Value: 30
F566 Period of Time 2 Starting Hour	Setting Range: 0～23	Mfr Value: 9
F567 Period of Time 2 Starting Minute	Setting Range: 0～59	Mfr Value: 30
F568 Period of Time 2 Stopping Hour	Setting Range: 0～23	Mfr Value: 11
F569 Period of Time 2 Stopping Minute	Setting Range: 0～59	Mfr Value: 30

F570 Period of Time 3 Starting Hour	Setting Range: 0～23	Mfr Value: 13
F571 Period of Time 3 Starting Minute	Setting Range: 0～59	Mfr Value: 10
F572 Period of Time 3 Stopping Hour	Setting Range: 0～23	Mfr Value: 14
F573 Period of Time 3 Stopping Minute	Setting Range: 0～59	Mfr Value: 20
F574 Period of Time 4 Starting Hour	Setting Range: 0～23	Mfr Value: 0
F575 Period of Time 4 Starting Minute	Setting Range: 0～59	Mfr Value: 0
F576 Period of Time 4 Stopping Hour	Setting Range: 0～23	Mfr Value: 0
F577 Period of Time 4 Stopping Minute	Setting Range: 0～59	Mfr Value: 0
F578 Period of Time 5 Starting Hour	Setting Range: 0～23	Mfr Value: 0
F579 Period of Time 5 Starting Minute	Setting Range: 0～59	Mfr Value: 0
F580 Period of Time 5 Stopping Hour	Setting Range: 0～23	Mfr Value: 0
F581 Period of Time 5 Stopping Minute	Setting Range: 0～59	Mfr Value: 0
F582 Period of Time 6 Starting Hour	Setting Range: 0～23	Mfr Value: 0
F583 Period of Time 6 Starting Minute	Setting Range: 0～59	Mfr Value: 0
F584 Period of Time 6 Stopping Hour	Setting Range: 0～23	Mfr Value: 0
F585 Period of Time 6 Stopping Minute	Setting Range: 0～59	Mfr Value: 0

·Time of start and stop can be set correspondingly according to each period of time. If power reconnection or malfunction protection happens and it is within the range of period of time and F213=1, the inverter will start automatically.

F586 Present Minute	Setting Range: 0～59	Mfr Value: 0
F587 Present Hour	Setting Range: 0～23	Mfr Value: 0

The value of present hour is set by F586. The value of present minute is set by F587.

Note: after changing the battery, please set F586, F587 and F620-F623 again.

5.6. Auxiliary Functions

Auxiliary function is only valid in the V/F control (F106=2).

F600 DC Braking Function Selection	Setting range: 0: not allowed; 1: braking before starting; 2: braking during stopping; 3: braking during starting and stopping	Mfr's value: 0
F601 Initial Frequency for DC Braking	Setting range: 1.00～5.00	Mfr's value: 1.00
F602 DC Braking Voltage before Starting	Setting range: 0～60	Mfr's value: 10
F603 DC Braking Voltage During Stopping		
F604 Braking Lasting Time Before Starting	Setting range: 0.0～10.0	Mfr's value: 0.5
F605 Braking Lasting Time During Stopping		

· When F600=0, DC braking function is not allowed.

· When F600=1, braking before starting is valid. After the right starting signal is input, inverter starts DC braking. After braking is finished, inverter will run from the initial frequency.

In some application occasion, such as fan, motor is running at a low speed or in a reverse status, if inverter starts immediately, OC malfunction will occur. Adopting "braking before starting" will ensure that the fan stays in a static state before starting to avoid this malfunction.

·During braking before starting, if "stop" signal is given, inverter will stop by deceleration time.

When F600=2, DC braking during stopping is selected, after output frequency declines to initial frequency for DC braking, the rotating motor is stop by DC braking.

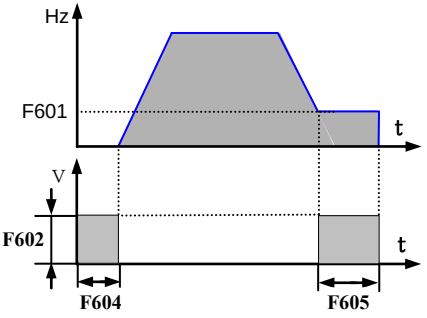


Figure 5-9 DC Braking

During the process of braking during stopping, if "start" signal is given, DC braking is finished and inverter will start.

If "stop" signal is given during the process of braking during stopping and inverter has no response, DC braking during stopping still goes on.

· Parameters related to "DC Braking": F601, F602, F604 and F605, interpreted as follows:

a. F601: Initial frequency of DC-braking. DC braking will start to work as inverter's output frequency is lower than this value.
b. F602: DC braking voltage. The bigger value will result in a quick braking. However, motor will overheat with too big value.
c. F604: Braking duration before starting. The time lasted for DC braking before inverter starts.
d. F605: Braking duration when stopping. The time lasted for DC braking while inverter stops.

·DC braking, as shown in Figure 5-9

Note: during DC braking, because motor does not have self-cold effect cause by rotating, it is in the state of easy over-heat. Please do not set DC braking voltage too high and do not set DC braking time to long.

F607 Selection of Stalling Adjusting Function	Setting range: 0: invalid; 1: valid	Mfr's value: 0
F608 Stalling Current Adjusting (%)	Setting range: 120～200	Mfr's value: 120
F609 Stalling Voltage Adjusting (%)	Setting range: 120～200	Mfr's value: 140
F610 Stalling Protection Judging Time	Setting range: 0.1～3000.0	Mfr's value: 5.0

Initial value of stalling current adjusting is set by F608, when the current is higher than this value, stalling current adjusting function is valid.

During the process of deceleration, stalling current function is invalid.

During the process of acceleration, if output current is higher than initial value of stalling current adjusting and F607=1, then stalling adjusting function is valid. Inverter will not accelerate until the output current is lower than initial value of stalling current adjusting.

In case of stalling during stable speed running, the frequency will drop. If the current returns to normal during dropping, the frequency will return to rise. Otherwise, the frequency will keep dropping to the minimum frequency and the protection OL1 will occur after it lasts for the time as set in F610.

F615 Daylight saving time conversion	Setting range: 0: Valid 1: Invalid	Mfr's value: 0

The initial date on which begins converting daylight saving time is May, 1st and the initial date on which restores daylight saving time is October 1st, system will set the clock ahead one hour at 0 o'clock on May 1st and system will put the clock back one hour at 1 o'clock on October 1st.

Note: Dividing time period function has priority to daylight saving time conversion function. When F560=2, the function of F615 will be invalid.

F616 Dividing time period conversion month 1	Setting range: 1~12	Mfr's value: 5
F617 Dividing time period conversion day 1	Setting range: 1~31	Mfr's value: 1
F618 Dividing time period conversion month 2	Setting range: 1~12	Mfr's value: 10
F619 Dividing time period conversion day 2	Setting range: 1~31	Mfr's value: 1

The initial month in which begins converting dividing time period 1 is set by F616. This parameter can be set as the initial month of converting daylight saving time when F560 is not equal to 2.

The initial date on which begins converting dividing time period 1 is set by F617. This parameter can be set as the initial date of converting daylight saving time when F560 is not equal to 2.

The initial month in which restores dividing time period 2 conversion is set by F618. This parameter can be set as the end month of converting daylight saving time when F560 is not equal to 2.

The initial date on which restores dividing time period 2 conversion is set by F619. This parameter can be set as the end date of converting daylight saving time when F560 is not equal to 2.

An example for dividing time period control: the beginning date of dividing time period CH1 is 1st, May and the beginning date of dividing time period CH2 is 30th, Nov, then water is supplied according to the setting parameters of CH1 from 1st, May to 30th, Nov and water is supplied according to the setting parameters of CH2 from 1st, Dec to 30th, Apr.

F620 Year	Setting range: 2000~3000	Mfr's value: 2008
F621 Month	Setting range: 1~12	Mfr's value: 7
F622 Day	Setting range: 1~31	Mfr's value: 8
F623 Week	Setting range: 1~7	Mfr's value: 2

Note: after changing the battery, please set F586, F587 and F620-F623 again.

F625 Frequency of 1st time period	Setting range: 0.00～F111	Mfr's value: 10.00
F626 Frequency of 2nd time period	Setting range: 0.00～F111	Mfr's value: 20.00
F627 Frequency of 3rd time period	Setting range: 0.00～F111	Mfr's value: 30.00
F628 Frequency of 4th time period	Setting range: 0.00～F111	Mfr's value: 40.00
F629 Frequency of 5th time period	Setting range: 0.00～F111	Mfr's value: 45.00
F630 Frequency of 6th time period	Setting range: 0.00～F111	Mfr's value: 50.00

5.7. Timing Control and Protection

F700 Selection of terminal free stop mode	Setting range: 0: free stop immediately; 1: delayed free stop	Mfr's value: 0
F701 Delay time for free stop and programmable terminal action	Setting range: 0.0～60.0S	Mfr's value: 0.0

· The function of F700 is only valid in the free stop mode controlled by terminals. The related parameters setting is F201=1, 2, 4 and F209=1.

· When "free stop immediately" is valid (F700=1), the delay time (F701) is invalid. If the delay time is 0 (i.e. F701=0), it means "free stop immediately".

· "Delayed free stop" means that upon receiving "free stop" signal, the inverter will execute "free stop" command after waiting some time instead of stopping immediately. Delay time is set by F701.

F702 Fan control mode (only valid for the power 11-710kw)	0:controlled by temperature 1: Do not controlled by temperature	Mfr's value: 11-22KW：0 30-710KW：1
F703 Setting fan control temperature	Setting range: 0～100℃	Mfr's value: 45℃

When fan's run is controlled by temperature, fan will run if radiator's temperature is up to setting temperature. When fan's run is not controlled by temperature, fan will run when power is supplied to the inverter. And fan will not stop until power off.

Fan control temperature is set by F703, the temperature is set by manufacture. User can only check it.

F705 Overloading Adjusting Gains	Setting range: 0～100	Mfr's value: 30
F706 Inverter Overloading Coefficient %	Setting range: 120～190	Mfr's value: 120
F707 Motor Overloading Coefficient %	Setting range: 20～100	Mfr's value: 100

· Inverter overloading coefficient: the ratio of overload-protection current and rated current, whose value shall be subject to actual load.
· Motor overloading coefficient (F707): when inverter drives lower power motor, please set the value of F707 by below formula in order to protect motor

$$\text{Motor Overloading Coefficient} = \frac{\text{Actual motor power}}{\text{Matching motor power}} \times 100\%。$$

Please set F707 according to actual situation. The lower the setting value of F707 is, the faster the overload protection speed. Please refer to Fig 5-10.

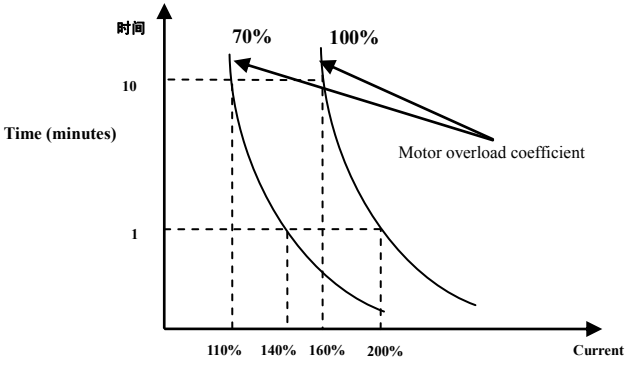


Fig 5-10 Motor overload coefficient

When the output frequency is lower than 10Hz, the heat dissipation effect of common motor will be worse. So when running frequency is lower than 10Hz, the threshold of motor overload value will be reduced. Please refer to Fig 5-11 (F707=100%):

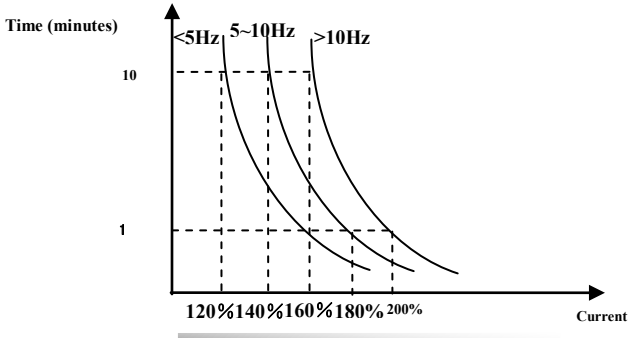


Fig 5-11 Motor overload protection value

For example: 7.5KW inverter drives 5.5KW motor, $F707=\frac{5.5}{7.5}\times 100\%\approx 70\%$. When the actual current of motor reaches 140% of inverter rated current, inverter overload protection will display after 1 minute.

F708	Record of The Latest Malfunction Type	2: Over-current 3: Over-voltage 4: Input out-phase 5: Inverter over-load 6: Input under-voltage 7: Inverter over-heat 8: Motor over-load 11: External Malfunction 13: ERR2 14: Contactor does not suck	
F709	Record of Malfunction Type for Last but One		
F710	Record of Malfunction Type for Last but Two		
F711	Fault Frequency of The Latest Malfunction		
F712	Fault Current of The Latest Malfunction		
F713	Fault PN End Voltage of The Latest Malfunction		
F714	Fault Frequency of Last Malfunction but One		
F715	Fault Current of Last Malfunction but One		
F716	Fault PN End Voltage of Last Malfunction but One		
F717	Fault Frequency of Last Malfunction but Two		
F718	Fault Current of Last Malfunction but Two		
F719	Fault PN End Voltage of Last Malfunction but Two		
F720	Record of overcurrent protection fault times		
F721	Record of overvoltage protection fault times		
F722	Record of overheat protection fault times		
F723	Record of overload protection fault times		
F724	Input out-phase	Setting range: 0: invalid; 1: valid	Mfr‘s value: 1
F725	Undervoltage	Setting range: 0: invalid; 1: valid	Mfr‘s value: 1
F726	Overheat	Setting range: 0: invalid; 1: valid	Mfr‘s value: 1
F728	Input out-phase filtering constant	Setting range: 0.1～60.0	Mfr‘s value: 5.0
F729	Undervoltage filtering constant	Setting range: 0.1～60.0	Mfr‘s value: 5.0
F730	Overheat protection filtering constant	Setting range: 0.1～60.0	Mfr‘s value: 5.0

·–Undervoltage” refers to too low voltage at AC input side. –Out-phase” refers to out-phase of three-phase

power supply.

·"Undervoltage" / "out-phase" signal filtering constant is used for the purpose of eliminating disturbance to avoid mis-protection. The greater the set value is, the longer the filtering time constant is and the better for the filtering effect.

5.8. Parameters of the Motor

F800	Reserved	
F801 Rated power	Setting range: 0.2～1000KW	
F802 Rated voltage	Setting range: 1～440V	
F803 Rated current	Setting range: 0.1～6553A	
F804 Numbers of motor poles	Setting range: 2～100	4
F805 Motor rated speed	Setting range: 2~30000	
F806～F809	Reserved	
F810 Motor rated frequency	Setting range: 1.0～300.0Hz	50.00
F811～F830	Reserved	

·Please set the parameters in accordance with those indicated on the nameplate of the motor.

5.9 Communication Parameter

F900 Communication Address	1~247: single inverter address 0: broadcast address	1
F901 Communication Mode	1: ASCII 2: RTU 3. Remote controlling keypad	1
F903 Odd/Even Calibration	Setting range: 0: no calibration 1: odd calibration 2:even calibration	0
F904 Baud Rate	Setting range: 0: 1200; 1: 2400; 2: 4800; 3: 9600; 4: 19200; 5: 38400; 6: 57600	3

Please set F901 to 3 to select remote controlling keypad. The keypad of inverter and remote controlling keypad can be used at the same time.

Communication parameters refer to Appendix 5.

Appendix 1 Trouble Shooting

When malfunction occurs to inverter, don‘t run by resetting immediately. Check any causes and get it removed if there is any.

Take counter measures by referring to this manual in case of any malfunctions on inverter. Should it still be unsolved, contact the manufacturer. Never attempt any repairing without due authorization.

Table 1-1 **Inverter‘s Common Cases of Malfunctions**

Fault	Description	Causes	Countermeasures
O.C.	Overcurrent	* too short acceleration time * short circuit at output side * locked rotor with motor	*prolong acceleration time; *whether motor cable is broken; *check if motor overloads; *reduce V/F compensation value
O.L1	Inverter Overload	* load too heavy	*reduce load; *check drive ratio; *increase inverter‘s capacity
O.L2	Motor Overload	* load too heavy	*reduce load; *check drive ratio; *increase inverter‘s capacity
O.E.	DC Over-Voltage	*supply voltage too high; *load inertia too big *deceleration time too short; *motor inertia rise again	*check if rated voltage is input; *add braking resistance(optional); *increase deceleration time
P.F1.	Input Out-Phase	*out-phase with input power	*check if power input is normal; *check if parameter setting is correct.
L.U.	Under-Voltage Protection	*input voltage on the low side	*check if supply voltage is normal *check if parameter setting is correct.
O.H.	Radiator Overheat	*environment temperature too high; *radiator too dirty *install place not good for ventilation; *fan damaged	*improve ventilation; *clean air inlet and outlet and radiator; *install as required; *change fan
C.B.	Contactor does not suck	*Too low voltage of power network *AC contactor damaged	*check the voltage *check the AC contactor
Motor not Running		*wrong wiring; *wrong setting; * too heavy load;	*check input, output and control line; *check parameter setting; *increase inverter‘s output capacity
Power Trips	Line-Current Too Big	*short circuit at input side; *too small capacity with air switch; *motor overload	*check input line; *check air switch capacity; *reduce load

* No P.F1. protection for three-phase under 4.0KW.

* C.B. protection only for inverters from 45KW to 710KW.

Table 1-2 **Motor Malfunction and Counter Measures**

Malfunction	Items to Be Checked	Counter Measures
Motor not Running	Supply voltage is on or normal? Normal with U,V,W 3-phase output? Locked rotor with motor? Panel with trouble indication?	Get connected with power; Check wiring; Disconnect and Reconnect; Reduce load; Check against Table 1-1
Wrong Direction of Motor Running	U, V, W wiring correct?	To correct wiring
Motor Turning but Speed Change not Possible	Wiring correct for lines with given frequency? Correct setting of running mode? Too big with load?	To correct wiring; To correct setting; Reduce load
Motor Speed Too High or Too Low	Motor's rated value correct? Drive ratio correct? Max output frequency value correct? Check if voltage drops between motor terminals too high?	Check motor nameplate data; Check speed change mechanism; Check setting; Check V/F Characteristic value
Motor Running Unstable	Too big load? Too big with load change? Single-phase or 3-phase for power? Out-phase? Motor malfunction.	Reduce load; reduce load change, increase capacity; Reactor to be added for single -phase power input. Correct wiring.

Table 1-3

Water supply malfunction codes and counter measures

Malfunction	Items to Be Checked	Counter Measures
PP	Line disconnection protection	The line of feedback is disconnected with the terminals. User should connect it again.
EP	inverter detects lack water signal	Introducing water into reservoir, then start the inverter.
NP	pressure protection	The feedback value is too large or too small.
ERR3	PID parameters are set improperly	Correcting the wrong parameters of function code.

Appendix 2 Products & Structures

F2000-P series inverter has its power range between 0.75～710KW. Refer to Tables 2-1 and 2-2 for main data. There may be two (or more than two) kinds of structures for certain products. Please make a clear indication when placing your order.

Inverter should operate under the rated output current, with overload permitted for a short time. However, it shall not exceed the allowable values at working time.

Table 2-1 **Product Summary of F2000-P**

Model	Rated voltage Input (V)	Rated Current Output (A)	Structure code	Applicable Motor (KW)	Remarks
F2000-P0007T3B	~400 (three-phase)	2.0	B3	0.75	Plastic Hanging
F2000-P0015T3B	~400 (three-phase)	4.0	B3	1.5	
F2000-P0022T3B	~400 (three-phase)	6.5	B3	2.2	
F2000-P0037T3B	~400 (three-phase)	8.0	B4	3.7	
F2000-P0040T3B	~400 (three-phase)	9.0	B4	4.0	
F2000-P0055T3B	~400 (three-phase)	12.0	B5	5.5	
F2000-P0075T3B	~400 (three-phase)	17.0	B5	7.5	
F2000-P0110T3C	~400 (three-phase)	23	C1	11	Metal Hanging
F2000-P0150T3C	~400 (three-phase)	32	C1	15	
F2000-P0185T3C	~400 (three-phase)	38	C2	18.5	
F2000-P0220T3C	~400 (three-phase)	44	C3	22	
F2000-P0300T3C	~400 (three-phase)	60	C3	30	
F2000-P0370T3C	~400 (three-phase)	75	C3	37	
F2000-P0450T3C	~400 (three-phase)	90	C5	45	
F2000-P0550T3C	~400 (three-phase)	110	C5	55	
F2000-P0750T3C	~400 (three-phase)	150	C5	75	
F2000-P0900T3C	~400 (three-phase)	180	C6	90	
F2000-P1100T3C	~400 (three-phase)	220	C7	110	
F2000-P1320T3C	~400 (three-phase)	265	C8	132	
F2000-P1600T3C	~400 (three-phase)	320	C8	160	
F2000-P1800T3C	~400 (three-phase)	360	C9	180	
F2000-P2000T3C	~400 (three-phase)	400	CA	200	
F2000-P2200T3C	~400 (three-phase)	440	CA	220	

F2000-P2500T3C	~400 (three-phase)	480	CB	250	
F2000-P2800T3C	~400 (three-phase)	520	CB	280	
F2000-P3150T3C	~400 (three-phase)	550	CB	315	
F2000-P1100T3D	~400 (three-phase)	220	D0	110	Metal Cabinet
F2000-P1320T3D	~400 (three-phase)	265	D1	132	
F2000-P1600T3D	~400 (three-phase)	320	D1	160	
F2000-P1800T3D	~400 (three-phase)	360	D1	180	
F2000-P2000T3D	~400 (three-phase)	400	D2	200	
F2000-P2200T3D	~400 (three-phase)	440	D2	220	
F2000-P2500T3D	~400 (three-phase)	480	D2	250	
F2000-P2800T3D	~400 (three-phase)	520	D3	280	
F2000-P3150T3D	~400 (three-phase)	550	D3	315	
F2000-P3550T3D	~400 (three-phase)	595	D3	355	
F2000-P4000T3D	~400(three-phase)	650	D4	400	
F2000-P4500T3D	~400 (three-phase)	770	D4	450	
F2000-P5000T3D	~400 (three-phase)	860	D5	500	
F2000-P5600T3D	~400 (three-phase)	950	D5	560	
F2000-P6300T3D	~400 (three-phase)	1100	D5	630	
F2000-P7100T3D	~400(three-phase)	1300	D5	710	

Table 2-2 F2000-P Types of Product Structure

Structure Code	External Dimension (A×B×H)	Mounting Size(W×L)	Mounting Bolt	Remarks
B3	143×148×200	132×187	M5	Plastic Hanging
B4	162×150×250	145×233	M5	
B5	200×160×300	182×282	M6	
C1	225×220×340	160×322	M6	Metal Hanging
C2	230×225×380	186×362	M6	
C3	265×235×435	235×412	M6	
C4	314×235×480	274×464	M6	
C5	360×265×555	320×530	M8	
C6	410×300×630	370×600	M10	
C7	516×326×760	360×735	M12	
C8	560×326×1000	390×970	M12	
C9	400×385×1300	280×1272	M10	

CA	535×380×1330	470×1300	M12	
CB	750×385×1430	600×1400	M12	
D0	580×500×1410	410×300	M16	Metal Cabinet
D1	600×500×1650	400×300	M16	
D2	660×500×1950	450×300	M16	
D3	800×600×2045	520×340	M16	
D4	1000×550×2000	800×350	M16	
D5	1200×600×2200	786×400	M16	

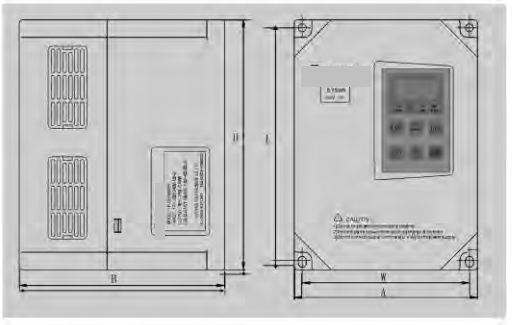


Fig 3-1 Plastic Profile

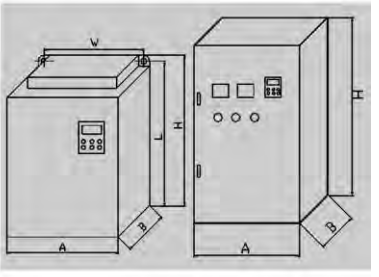
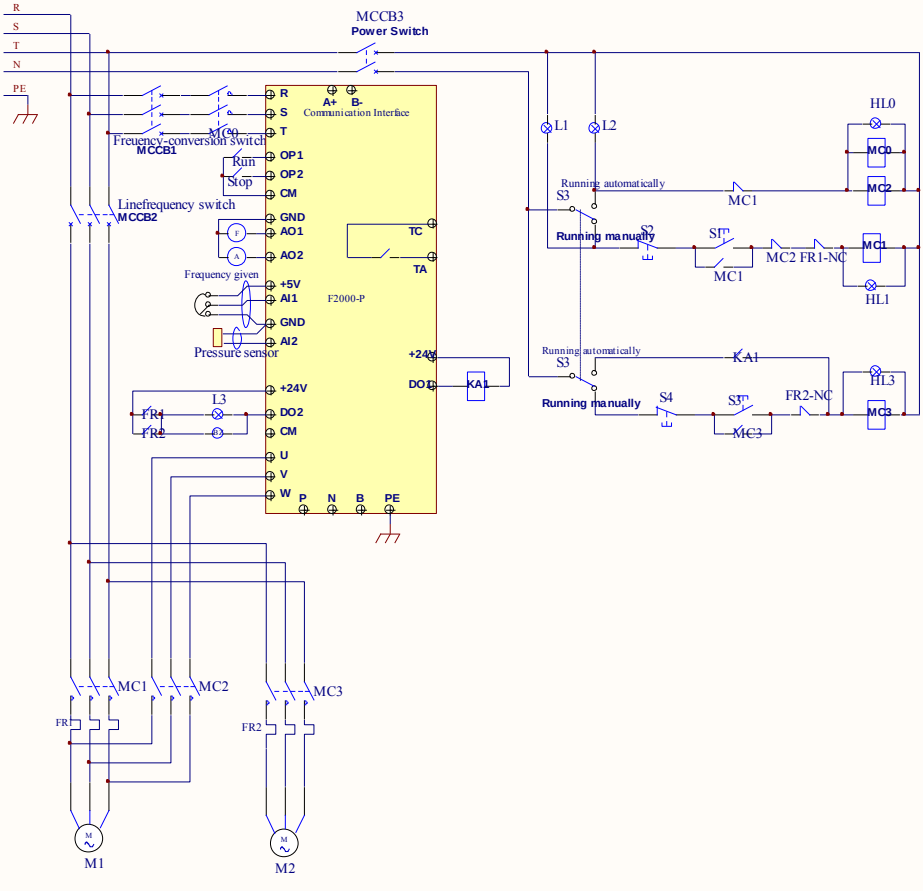
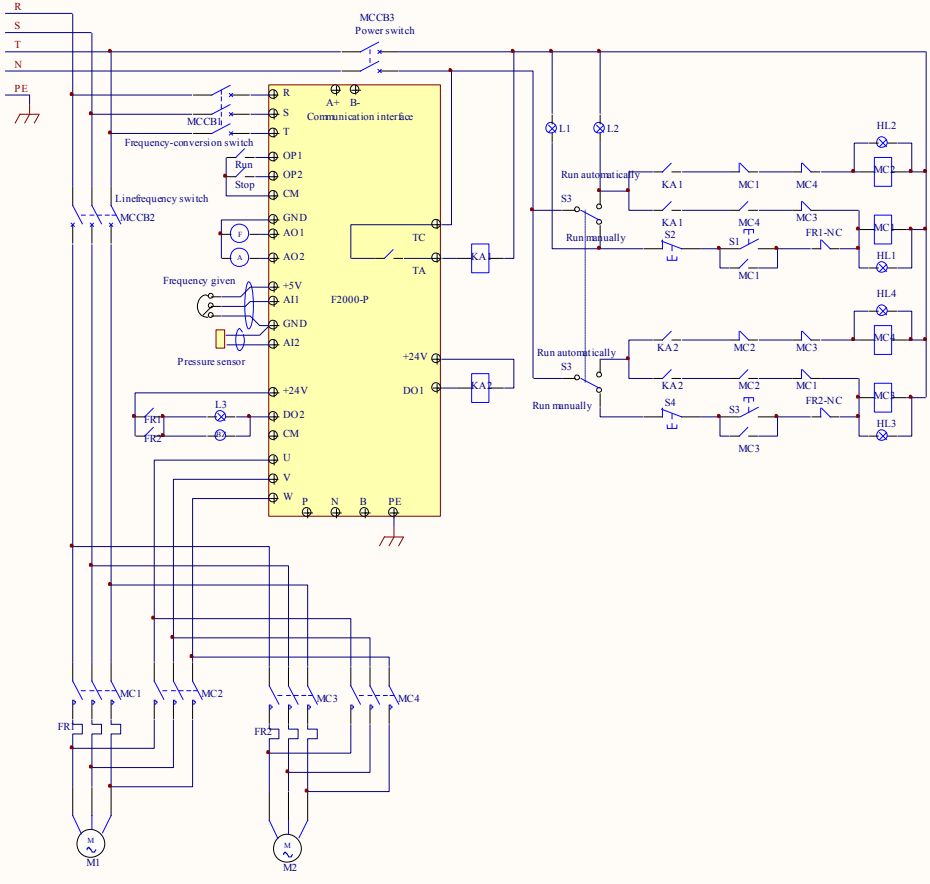


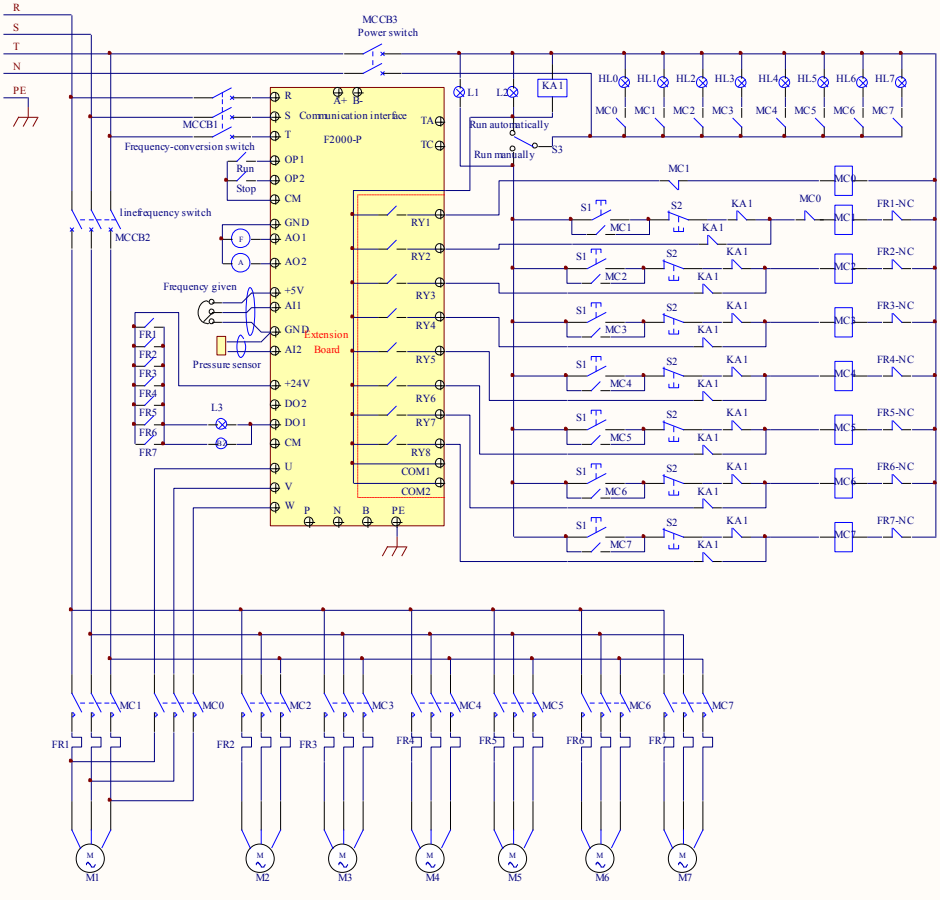
Fig 3-2 Metal Profile



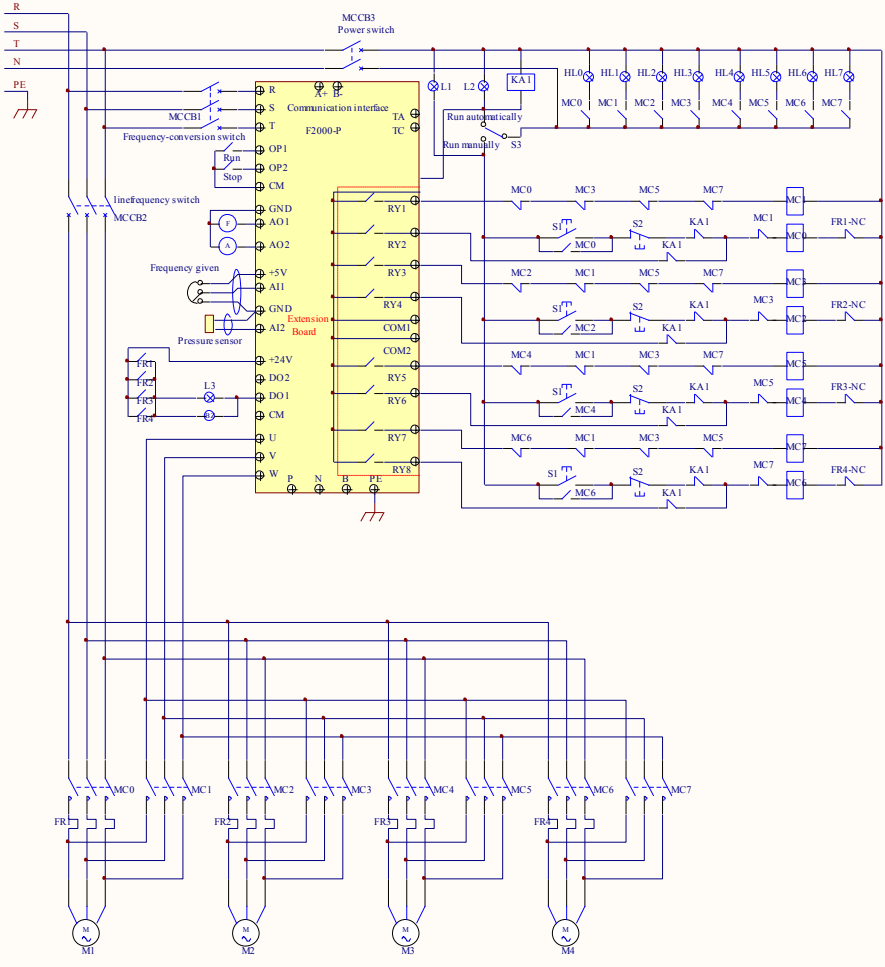
2. L1 is manual indicator light, L2 is automatic indicator light.
3. HL0~HL3 are motor running indicator light.
4. S1 and S3 are manual starting switches, S2 and S4 are manual stopping switches.
5. S3 is manual and automatic converting switch.
6. L3 and buzzer BZ are alarm indicators, which specification should be DC24V.
7. In automatic status, when there is no signal for KA1, M1 is frequency-conversion pump and linefrequency pump does not exist. In automatic status, when there is signal for KA1, M1 is frequency-conversion pump and M2 is linefrequency pump. In manual status, M1 and M2 are controlled as linefrequency pump.



3. HL1~HL4 are motor running indicator light.
4. S1 and S3 are manual starting switches, S2 and S4 are manual stopping switches.
5. S3 is manual and automatic converting switch.
6. L3 and buzzer BZ are alarm indicators, which specification should be DC24V.
7. When KA1 is ~~a~~ction" at first and KA2 is ~~a~~ction" later, M1 is frequency-conversion pump and M2 is linefrequency pump.
8. When KA2 is ~~a~~ction" at first and KA1 is ~~a~~ction" later, M1 is linefrequency pump and M2 is frequency-conversion pump.



3. L1 is manual indicator light, L2 is automatic indicator light.
4. HL0~HL7 are motor running indicator light.
5. S1 is manual starting switch, S2 is manual stopping switch.
6. S3 is manual and automatic converting switch.
7. KA1 is protection switch of manual and automatic converting.
8. L3 and buzzer BZ are alarm indicators, which specification should be DC24V.



7. L3 and buzzer BZ are alarm indicators, which specification should be DC24V.

Appendix 4 Selection of inverter accessories

1: Box driving several pumps EPC50

EPC50 is used to drive several pumps, which does not need single power supply.
It is connected to inverter with ten cores connection which can realize fixed mode of 1 inverter driving eight pumps and rotating mode of 1 inverter driving four pumps.

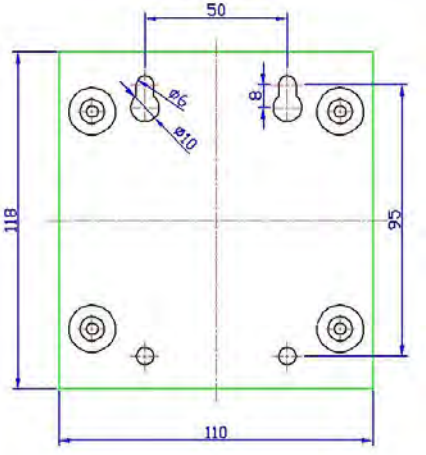


Fig3-3 Installation Dimensions is 95mm*50mm，using four Φ6 screws

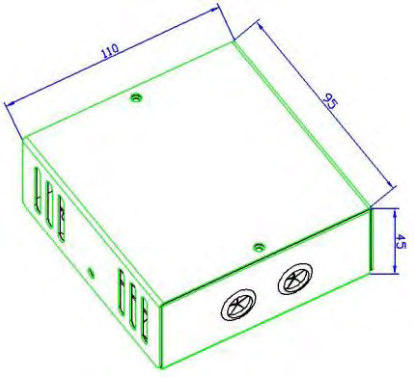


Fig3-4 Appearance size is 110mm*95mm*45mm（L*W*H）

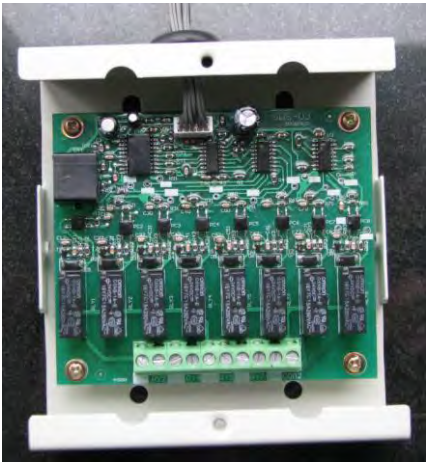


Fig 3-5 Internal wiring

Fig3-6 Overall wiring

Appendix 5 Communication Manual

(Version 1.7)

I. General

Modbus is a serial and asynchronous communication protocol. Modbus protocol is a general language applied to PLC and other controlling units. This protocol has defined an information structure which can be identified and used by a controlling unit regardless of whatever network they are transmitted.

You can read reference books or ask for the details of MODBUS from manufactures.

Modbus protocol does not require a special interface while a typical physical interface is RS485.

II. Modbus Protocol

1. Overall Description

(1) Transmission mode

1) ASCII Mode

In ASCII mode, one Byte (hexadecimal format) is expressed by two ASCII characters.

For example, 31H (hexadecimal data) includes two ASCII characters'3(33H)','1(31H)'.

Common characters, ASCII characters are shown in the following table:

Characters	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII Code	30H	31H	32H	33H	34H	35H	36H	37H
Characters	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII Code	38H	39H	41H	42H	43H	44H	45H	46H

2) RTU Mode

In RTU mode, one Byte is expressed by hexadecimal format. For example, 31H is delivered to data packet.

(2) Baud rate

Setting range: 1200, 2400, 4800, 9600, 19200, 38400, 57600

(3) Frame structure:

1) ASCII mode

Byte	Function
1	Start Bit (Low Level)
7	Data Bit
0/1	Parity Check Bit (None for this bit in case of no checking. Otherwise 1 bit)
1/2	Stop Bit (1 bit in case of checking, otherwise 2 bits)

2) RTU mode

Byte	Function
1	Start Bit (Low Level)
8	Data Bit

0/1	Parity Check Bit (None for this bit in case of no checking. Otherwise 1 bit)
1/2	Stop Bit (1 bit in case of checking, otherwise 2 bits)

(4) Error Check

1) ASCII mode

Longitudinal Redundancy Check (LRC): It is performed on the ASCII message field contents excluding the _cdon' character that begins the message, and excluding the CRLF pair at the end of the message.
The LRC is calculated by adding together successive 8–bit bytes of the message, discarding any carries, and then two's complementing the result.
A procedure for generating an LRC is:
1. Add all bytes in the message, excluding the starting _cdon' and ending CRLF. Add them into an 8–bit field, so that carries will be discarded.
2. Subtract the final field value from FF hex (all 1's), to produce the ones–complement.
3. Add 1 to produce the twos–complement.

2) RTU Mode

Cyclical Redundancy Check (CRC): The CRC field is two bytes, containing a 16–bit binary value.
The CRC is started by first preloading a 16–bit register to all 1's. Then a process begins of applying successive 8–bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do not apply to the CRC.
A procedure for generating a CRC-16 is:
1. Load a 16–bit register with FFFF hex (all 1's). Call this the CRC register.
2. Exclusive OR the first 8–bit byte of the message with the high–order byte of the 16–bit CRC register, putting the result in the CRC register.
3. Shift the CRC register one bit to the right (toward the LSB), zero–filling the MSB. Extract and examine the LSB.
4. (If the LSB was 0): Repeat Step 3 (another shift).
(If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001).
5. Repeat Steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8–bit byte will have been processed.
When the CRC is appended to the message, the low-order byte is appended first, followed by the

high-order byte.

2. Command Type & Format

(1) The listing below shows the function codes.

code	name	description
03	Read Holding Registers	Read the binary contents of holding registers in the slave. (Less than 10 registers once time)
06	Preset Single Register	Preset a value into holding register

(2) Format

1) ASCII mode

Start	Address	Function	Data				LRC check		End	
: (0X3A)	Inverter Address	Function Code	Data Length	Data 1	…	Data N	High-order byte of LRC	Low-order byte of LRC	Return (0X0D)	Line Feed (0X0A)

2） RTU mode

Start	Address	Function	Data	CRC check		End
T1-T2-T3-T4	Inverter Address	Function Code	N data	Low-order byte of CRC	High-order byte of CRC	T1-T2-T3-T4

3) Protocol Converter

It is easy to turn a RTU command into an ASCII command followed by the lists:

1) Use the LRC replacing the CRC.
2) Transform each byte in RTU command into a corresponding two byte ASCII. For example: transform 0x03 into 0x30, 0x33 (ASCII code for 0 and ASCII code for 3).
3) Add a _colon‘ (:) character (ASCII 3A hex) at the beginning of the message.
4) End with a _carriage return – line feed‘ (CRLF) pair (ASCII 0D and 0A hex).

So we will introduce RTU Mode in followed part. If you use ASCII mode, you can use the up lists to convert.

(3) Address and meaning

The part introduces inverter running, inverter status and related parameters setting.

Description of rules of function codes parameters address:

1) Use the function code as parameter address

General Series:

High-order byte: 01~0A (hexadecimal)

Low-order byte: 00~50 (max range) (hexadecimal) Function code range of each partition is not the same. The specific range refers to manual.

For example: F114 (display on the board), parameter address is 010E (hexadecimal).

F201 (display on the board), parameter address is 0201 (hexadecimal).

Note: in this situation, it allows to read six function codes and write only one function code. Some function codes can only be checked but cannot be modified; some function codes can

neither be checked nor be modified; some function codes can not be modified in run state; some function codes can not be modified both in stop and run state.

In case parameters of all function codes are changed, the effective range, unit and related instructions shall refer to user manual of related series of inverters. Otherwise, unexpected results may occur.

2) Use different parameters as parameter address

(The above address and parameters descriptions are in hexadecimal format, for example, the decimal digit 4096 is represented by hexadecimal 1000).

1. Running status parameters

Parameters Address	Parameter Description（read only）
1000	Output frequency
1001	Output voltage
1002	Output current
1003	Pole numbers/ control mode, high-order byte is pole numbers, low-order byte is control mode.
1004	Bus-line voltage
1005 ----F2000	Drive ratio/inverter status High-order byte is drive ratio, low-order byte is inverter status Inverter status: 00: Standby mode 01: Forward running 02: Reverse running 04: Over-current (OC) 05: DC over-current (OE) 06: Input Out-phase (PF1) 07: Frequency Over-load (OL1) 08: Under-voltage (LU) 09: Overheat (OH) 0A: Motor overload (OL2) 0B: Interference (ERR) 0C: LL 0D: External Malfunction (ESP) 0F: ERR2 10: Lack water protection (EP) 11：Line disconnection protection (PP) 12：Pressure protection (NP) 13：PID parameters are set improperly (ERR3) 14：Contactor does not suck (CB)

2. Control commands

Parameters Address	Parameters Description（write only）
2000	Command meaning: 0001：Forward running (no parameters） 0002：Reverse running（no parameters） 0003：Deceleration stop 0004：Free stop

	0005：Forward jogging start 0006：Forward jogging stop 0007：Reserved 0008：Run（no directions） 0009：Fault reset 000A: Forward jogging stop 000B: Reverse jogging stop
2001	Lock parameters 0001：Relieve system locked (remote control locked） 0002：Lock remote control (any remote control commands are no valid before unlocking）

Command types of F2000 series do not belong to every inverter models.

3. Illegal Response When Reading Parameters

Command Description	Function	Data
Slave parameters response	The highest-oder byte changes into 1.	Command meaning: 0001: Illegal function code 0002: Illegal address 0003: Illegal data 0004: Slave fault (Note 2)

Note 2: Illegal response 0004 appears below two cases:

1. Do not reset inverter when inverter is in the malfunction state.
2. Do not unlock inverter when inverter is in the locked state.

The following is response command when read/write parameters:

Eg1: In RTU mode, change acc time (F114) to 10.0s in NO.01 inverter.

Query

Address	Function	Register Address Hi	Register Address Lo	Preset Data Hi	Preset Data Lo	CRC Lo	CRC Hi
01	06	01	0E	00	64	E8	1E

Function code F114 Value: 10.0S

Normal Response

Address	Function	Register Address Hi	Register Address Lo	Response Data Hi	Response Data Lo	CRC Lo	CRC Hi
01	06	01	0E	00	64	E8	1E

Function code F114 Normal Response

Abnormal Response

Address	Function	Abnormal code	CRC Lo	CRC Hi
01	86	04	43	A3

The max value of function code is 1. Slave fault

Eg 2： Read output frequency, output voltage, output current and current rotate speed from N0.2 inverter.

Host Query

Address	Function	First Register Address Hi	First Register Address Lo	Register count Hi	Register count L0	CRC Lo	CRC Hi
02	03	10	00	00	04	40	FA

Communication Parameters Address 1000H

Slave Response：

Address	Function	Byte Count	Data Hi	Data Lo	Data Hi	Data Lo	Data Hi	Data Lo	Data Hi	Data Lo	Crc Lo	Crc Hi
02	03	08	13	88	01	90	00	3C	02	00	42	F5

Output Frequency Output Voltage Output Current Numbers of Pole Pairs Control Mode

NO.2 Inverter's output frequency is 50.00Hz, output voltage is 400V, output current is 6.0A, numbers of pole pairs are 2 and inverter is controlled by keypad.

Eg 3： NO.1 Inverter runs forwardly.

Host Query:

Address	Function	Register Hi	Register Lo	Write status Hi	Write status Lo	CRC Lo	CRC Hi
01	06	20	00	00	01	43	CA

Communication parameters address 2000H Forward running

Slave Normal Response:

Address	Function	Register Hi	Register Lo	Write status Hi	Write status Lo	CRC Lo	CRC Hi
01	06	20	00	00	01	43	CA

Normal Response

Slave Abnormal Response:

Address	Function	Abnormal Code	CRC Lo	CRC Hi
01	86	01	83	A0

The max value of function code is 1. Illegal function code (assumption)

Eg4: Read the value of F113, F114 from NO.2 inverter

Host Query：

Address	Function	Register Address Hi	Register Address Lo	Register Count Hi	Register Count L0	CRC Lo	CRC Hi
02	03	01	0D	00	02	54	07

Communication Parameter Address F10DH Numbers of Read Registers

Slave Normal Response：

Address	Function	Byte count	The first parameters status Hi	The first parameters status Lo	The second parameters status Hi	The second parameters status Lo	CRC Lo	CRC Hi
02	03	04	03	E8	00	78	49	61

The actual value is 10.00. **The actual value is 12.00.**

Slave Abnormal Response：

Address	Function Code	Abnormal Code	CRC Lo	CRC Hi
02	83	03	F1	31

The max value of function code is 1. **Abnormal data**

3. Additional Remarks

Expressions during communication course:

Parameter Values of Frequency＝actual value X 100 (General Series)
Parameter Values of Frequency＝actual value X 10 (Medium Frequency Series)
Parameter Values of Time=actual value X 10
Parameter Values of Current=actual value X 100
Parameter Values of Voltage=actual value X 1
Parameter Values of Power=actual value X 100
Parameter Values of Drive Ratio=actual value X 100
Parameter Values of Version No. =actual value X 100

Instruction: Parameter value is the value sent in the data package. Actual value is the actual value of inverter. After PC/PLC receives the parameter value, it will divide the corresponding coefficient to get the actual value.

NOTE: Take no account of radix point of the data in the data package when PC/PLC transmits command to inverter. The valid value is range from 0 to 65535.

Ⅲ Function Codes Related to Communication

Function Code	Function Definition	Setting Rang	Mfr's Value
F200	Source of start command	0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3:MODBUS; 4: Keyboard＋Terminal＋MODBUS	0
F201	Source of stop command	0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3:MODBUS; 4: Keyboard＋Terminal＋MODBUS	0
F203	Main frequency source X	0: Digital setting memory; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4：Stage speed control; 5: No memory by digital setting; 6:Keyboard potentiometer; 7~8: Reserved; 9: PID adjusting; 10: MODBUS	0
F900	Inverter Address	1~247	1

F901	Modbus Mode Selection	1: ASCII mode 2: RTU mode	1
F903	Parity Check Selection	0: No checkout 1: Odd 2: Even	0
F904	Baud Rate	0: 1200 1: 2400 2: 4800 3: 9600 4: 19200 5: 38400 6: 57600	3

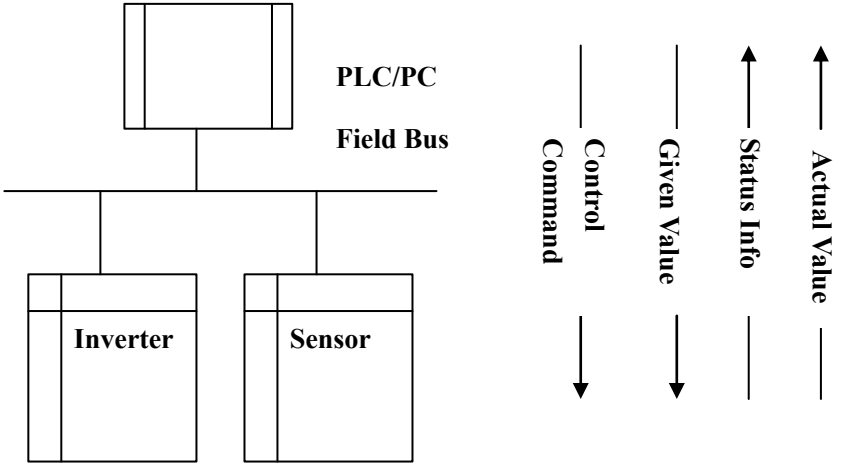
Please set functions code related to communication consonant with the PLC/PC communication parameters, when inverter communicates with PLC/PC.

Ⅳ Physical Interface

1. Interface instruction

Communication interface of RS485 is located on the most left of control terminals, marked underneath with A+ and B-

2. Structure of Field Bus



Connecting Diagram of Field Bus

RS485 Half-duplex communication mode is adopted for F2000-P series inverter. Daisy chain structure is adopted by 485 Bus-line. Do not use 'spur' lines or a star configuration. Reflect signals which are produced by spur lines or star configuration will interfere in 485 communications.

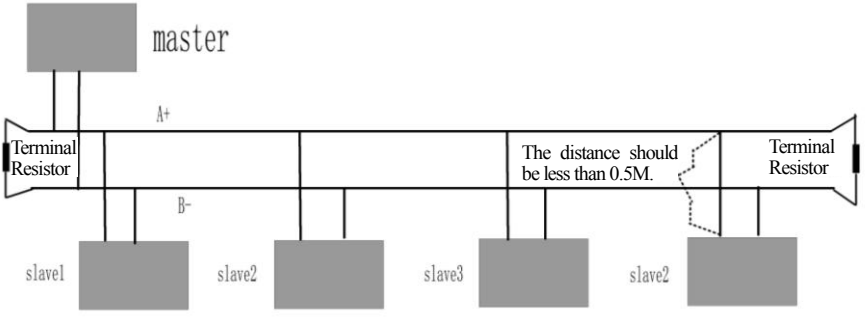
Please note that for the same time in half-duplex connection, only one inverter can have communication with PC/PLC. Should two or more than two inverters upload data at the same time, then bus competition

will occur, which will not only lead to communication failure, but higher current to certain elements as well.

3. Grounding and Terminal

Terminal resistance of 120 Ω will be adopted for terminal of RS485 network, to diminish the reflection of signals. Terminal resistance shall not be used for intermediate network. Please connect terminal resistance to A+, B- terminals of the first and the last inverters.

No direct grounding shall be allowed for any point of RS485 network. All the equipment in the network shall be well grounded via their own grounding terminal. Please note that grounding wires will not form closed loop in any case.



Connecting Diagram of Terminal Resistance

Please think over the drive capacity of PC/PLC and the distance between PC/PLC and inverter when wiring. Add a repeaters if drive capacity is not enough.

All wiring connections for installation shall have to be made when the inverter is disconnected from power supply.

Appendix 5 Zoom Table of Function Code

Function Section	Function Code	Function Definition	Setting Range	Mfr's Value	Change
Basic Parameters	F100	User's Password	0～9999	8	√
	F102	Inverter's Rated Current (A)	2.0～6500.0	Subject to inverter model	*
	F103	Inverter Power (KW)	0．75～710KW	Subject to inverter model	*
	F104	Inverter Power Code	100～400	Subject to inverter model	*
	F105	Software Edition No.	1.00～10.00	Subject to inverter model	*
	F106	Control mode	2: V/F	2	×
	F107	Password Valid or Not	0: invalid; 1: valid	0	√
	F108	Setting User's Password	0～9999	8	√
	F109	Starting Frequency (Hz)	0.0～10.00Hz	0.00Hz	√
	F110	Holding Time of Starting Frequency (S)	0.0～10.0S	0.0	√
	F111	Max Frequency (Hz)v	F113～60.0Hz	50.00Hz	√
	F112	Min Frequency (Hz)	0.00Hz～F113	0.50Hz	√
	F113	Target Frequency (Hz)	F111～F112	50.00Hz	√
	F114	1st Acceleration Time	0.1～3000S	5.0S for 0.75～3.7KW 60.0S for 5.5～30KW	√
	F115	1st Deceleration Time	0.1～3000S	60.0S for 37~90KW 120.0S for 110~710KW	√
	F116	2nd Acceleration Time	0.1～3000S	11.0S for 0.75～3.7KW 80.0S for 5.5～30KW	√
	F117	2nd Deceleration Time	0.1～3000S	120.0S for 37~90KW 150.0S for 110~710KW	√
	F118	Turnover Frequency	15.00～60.0Hz	50.00	×
	F119	Reserved			
	F120	Forward/Reverse Switchover dead-Time	0.0～3000S	0.0S	√
	F121	Reserved			
	F122	Reverse Running Forbidden	0: invalid; 1: valid	0	×
	F123	Reserved			
	F124	Jogging Frequency	F112～F111	5.00Hz	√
	F125	Jogging Acceleration Time	0.1～3000S	5.0S	√
	F126	Jogging Deceleration Time	0.1～3000S	5.0S	√

Basic Parameters	F127	Skip Frequency A	0.00～60.0Hz	0.00Hz	√
	F128	Skip Width A	±2.50Hz	0.00	√
	F129	Skip Frequency B	0.00～60.0Hz	0.00Hz	√
	F130	Skip Width B	±2.50Hz	0.00	√
	F131	Running Display Items	0－Present output frequency / function code 1－Present time 2－Output current 4－Output voltage 8－PN voltage 16－PID feedback value 32－Temperature 64－PID setting value 128－Linear speed 256－Speed 512－Motor output power	0＋1+2+4＋8＋16＋64＝95	√
	F132	Display items of stop	0: frequency / function code 1: Keyboard jogging 2: PID setting value 4: PN voltage 8: PID feedback value 16: Temperature 32: time 64: Speed	0+2+4+8+32=46	√
	F133	Drive Ratio of Driven System	0.10～200.0	1.0	√
	F134	Transmission-wheel radius	0.001～1.000（m）	0.001	√
	F135	Reserved			
	F136	Slip compensation	0～10%	0	×
	F137	Modes of torque compensation	0: Linear compensation; 1: Square compensation; 2: User-defined multipoint compensation	0	×
	F138	Linear compensation	1～16	subject to power 0.75-4.0：5 5.5-22：3 30-75：2 Above 90：1	×
	F139	Square compensation	1：1.5；　2：1.8； 3：1.9；　4：2.0	1	×
	F140	User-defined frequency point 1	0～F142	1.00	×
	F141	User-defined voltage point 1	0～100%	4	×
	F142	User-defined frequency point 2	F140～F144	5.00	×
	F143	User-defined voltage point 2	0～100%	13	×

Basic Parameters	F144	User-defined frequency point 3	F142～F146	10.00	×
	F145	User-defined voltage point 3	0～100%	24	×
	F146	User-defined frequency point 4	F144～F148	20.00	×
	F147	User-defined voltage point 4	0～100%	45	×
	F148	User-defined frequency point 5	F146～F150	30.00	×
	F149	User-defined voltage point 5	0～100%	63	×
	F150	User-defined frequency point 6	F148～F118	40.00	×
	F151	User-defined voltage point 6	0～100%	81	×
	F152	Output voltage corresponding to turnover frequency	10～100%	100	×
	F153	Carrier frequency setting	1K~10K	Subject to power: 0.7-7.5: 5000 11-30: 4000 37~90: 3000 Over 110: 2000	×
	F154	Auto voltage adjusting	0：no adjusting 1：adjusting	0	×
	F155	Digital accessorial frequency setting	0～F111	0	×
	F156	Digital accessorial frequency polarity setting	0: positive 1: negative	0	×
	F157	Reading accessorial frequency			Δ
	F158	Reading accessorial frequency polarity			Δ
	F159	Random carrier-wave frequency selection	0: Control speed normally; 1: Random carrier-wave frequency		
	F160	Reverting to manufacturer values	0: Not reverting to manufacturer values; 1: Reverting to manufacturer values	0	×
Running Control Mode	F200	Source of start command	0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3:MODBUS; 4: Keyboard ＋Terminal＋MODBUS	0	×
	F201	Source of stop command	0: Keyboard command; 1: Terminal command; 2: Keyboard＋Terminal; 3:MODBUS; 4: Keyboard ＋Terminal＋MODBUS	0	×

Running Control Mode	F202	Mode of direction setting	0: Forward running locking; 1: Reverse running locking; 2: Terminal setting	0	×
	F203	Main frequency source X	0: Digital setting memory; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4: Time period speed control; 5: No memory by digital setting; 6:Keyboard potentiometer; 7~8: Reserved; 9: PID adjusting; 10: MODBUS	0	×
	F204	Accessorial frequency source Y	0: Digital setting memory; 1: External analog AI1; 2: External analog AI2; 3~4: Reserved; 5: PID adjusting; 6: Reserved	0	×
	F205	Reference for selecting accessorial frequency source Y range	0: Relative to max frequency; 1: Relative to frequency X	1	×
	F206	Accessorial frequency Y range	0～100%	100	×
	F207	Frequency source selecting	0: X; 1: X+Y; 2: X or Y (terminal switchover); 3: X or X+Y (terminal switchover); 4: Reserved 5: X-Y 6: X+(Y-50%)	0	×
	F208	Terminal two-line/three-line operation control	0:other type; 1:two-line type 1; 2: two-line type 2; 3: three-line operation control 1; 4: three-line operation control 2; 5: start/stop controlled by direction impulse	0	×
	F209	Selecting the mode of stopping the motor	0: stop by deceleration time; 1: free stop	0	×
	F210	Frequency display accuracy	0.01～2.00	0.01	√
	F211	Speed of digital speed control	0.01～100.00Hz/S	5.00	√
	F212	Reserved			
	F213	Selfstarting after repowered on	0: invalid; 1: valid	0	√
	F214	Selfstarting after reset	0: invalid; 1: valid	0	√
	F215	Selfstarting delay time	0.1～3000.0	60.0	√
	F216	Times of selfstarting in case of repeated faults	0～5	0	√
	F217	Delay time for fault reset	0.0～10.0	3.0	√
	F218～F219	Reserved			
	F220	Frequency memory after power-down	0: invalid; 1: valid	0	√
	F221～F230	Reserved			

Function Section	Function Code	Function Definition	Setting Range	Mfr's Value	Change
Multifunctional Input and Output Terminals	F300	Relay token output	0: no function; 1: inverter fault protection; 2: over latent frequency 1; 3: over latent frequency 2; 4: free stop; 5: inverter is running 1; 6: DC braking; 7: acceleration/deceleration time switchover; 8~9: reserved; 10: inverter overload pre-alarm; 11: motor overload pre-alarm; 12: stalling; 13: Line disconnection protection 14: Lack water alarm 15: frequency arrival output; 16: overheat pre-alarm; 17: over latent current output 18: Starting Linefrequency Pump 19: Inverter is ready 20: Starting frequency-conversion pump 21: inverter is running 2 22: Over-limit pressure token	1	√
	F301	DO1 token output		21	√
	F302	DO2 token output		0	√
	F307	Characteristic frequency 1	F112～F111	10.00Hz	√
	F308	Characteristic frequency 2	F112～F111	50.00Hz	√
	F309	Characteristic frequency width	0～100%	50%	√
	F310	Characteristic current	0～1000A	Rated current	√
	F311	Characteristic current hysteresis loop width	0～100%	10%	√
	F312	Frequency arrival threshold	0.00～5.00Hz	0.00	√
	F316	OP1 terminal function setting	0: no function; 1: running terminal; 2: stop terminal; 3: Lack water signal; 4: Signal of water; 5~6: Reserved; 7: reset terminal; 8: free stop terminal; 9: external emergency stop terminal; 10: acceleration/deceleration forbidden terminal; 11: forward run jogging; 12: reverse run jogging; 13: UP frequency increasing terminal; 14: DOWN frequency decreasing terminal; 15: "FWD" terminal; 16: "REV" terminal; 17: three-line type input "X" terminal; 18: acceleration/deceleration time switchover terminal; 19~20: Reserved;	11	√
	F317	OP2 terminal function setting		3	√
	F318	OP3 terminal function setting		4	√
	F319	OP4 terminal function setting		16	√
	F320	OP5 terminal function setting		8	√

	F321	OP6 terminal function setting	21: frequency source switchover terminal; 22～30: Reserved	15	√
	F324	Free stop terminal logic	0: positive logic 1: negative logic	0	×
	F325	External emergency stop terminal logic		0	×
	F326	Input frequency of max pulse	0～9999	5000	√
	F327	Corresponding frequency for max input pulse frequency	50.00～650.0Hz	50.00	√
	F328	Terminal filter times	1～100	5	√
	F329～F330	Reserved			

Function Section	Function Code	Function Definition	Setting Range	Mfr's Value	Change
Analog Input and Output	F400	Lower limit of AI1 channel input	0.00～F402	0.00V	√
	F401	Corresponding setting for lower limit of AI1 input	0～F403	1.00	√
	F402	Upper limit of AI1 channel input	F400～5.00V	5.00V	√
	F403	Corresponding setting for upper limit of AI1 input	Max（1.00，F401）～2.00	2.00	√
	F404	AI1 channel proportional gain K1	0.0～10.0	1.0	√
	F405	AI1 filtering time constant	0.1～10.0	5.0	√
	F406	Lower limit of AI2 channel input	0.00～F408	0.01V	√
	F407	Corresponding setting for lower limit of AI2 input	0～F409	1.00	√
	F408	Upper limit of AI2 channel input	F406～5.00V	5.00V	√
	F409	Corresponding setting for upper limit of AI2 input	Max（1.00，F407）～2.00	2.00	√
	F410	AI2 channel proportional gain K2	0.0～10.0	1.0	√
	F411	AI2 filtering time constant	0.1～10.0	9.0	√
	F412	Lower limit of AI3 channel input	0.00～F414	0.00V	√
	F413	Corresponding setting for lower limit of AI3 input	0～F415	1.00	√
	F414	Upper limit of AI3 channel input	F412～5.0V	5.0V	√
	F415	Corresponding setting for upper limit of AI3 input	Max（1.00，F413）～2.00	2.00	√
	F416	AI3 channel proportional gain K1	0.0～10.0	1.0	√

	F417	AI3 filtering time constant	0.1～10.0	9.0	√
	F418	AI1 channel 0Hz voltage dead zone	0～0.50V (Positive-Negative)	0.00	√
	F419	AI2 channel 0Hz voltage dead zone	0～0.50V (Positive-Negative)	0.00	√
	F420	AI3 channel 0Hz voltage dead zone	0～0.50V (Positive-Negative)	0.00	√
	F421~F422	Reserved			
	F423	AO1 output range selecting	0：0～5V；1：0～10V	0	√
	F424	Corresponding frequency for lowest voltage of AO1 output	0.0～F425	0.05Hz	√
	F425	Corresponding frequency for highest voltage of AO1 output	F425～F111	50.00Hz	√
	F426	AO1 output compensation	0～120%	100	√
	F427	AO2 output range	0：0～20mA；1：4～20mA	0	√
	F428	AO2 lowest corresponding frequency	0.0～F429	0.05Hz	√
	F429	AO2 highest corresponding frequency	F428～F111	50.00	√
	F430	AO2 output compensation	0～120%	100	√
	F431	AO1 analog output signal selecting	0: Running frequency; 1: Output current; 2: Output voltage; 3～5: Reserved 6: Output motor power	0	√
	F432	AO2 analog output signal selecting		1	√
	F433	Corresponding current for full range of external voltmeter	0.01～5.00 times of rated current	2	×
	F434	Corresponding current for full range of external ammeter		2	×
	F435～F440	Reserved			

Function Section	Function Code	Function Definition	Setting Range	Mfr's Value	Change
PI parameters	F500	PID working mode	0: Single pump 1: Fixed mode 2: Timing interchanging 3:Frequency-conversion Circulating 4: Frequency-conversion pumps do not restart.	0	×
	F501	PID adjusting target given source	0: Given by digital 1: Given by AI1 2: Given by AI2 3: Given by potentiometer 4: Given by PC/PLC	0	×
	F502	PID adjusting feedback given source	1: AI1 2: AI2	1	×
	F503	Max limit of PID adjusting	10.0～100.0%	90.0	√
	F504	Digital setting value of PID adjusting	10.0～100.0%	70.0	√
	F505	Min limit of PID adjusting	0.0～100.0%	5.0	√
	F506	PID polarity	0: Negative feedback 1: Positive feedback	1	×
	F507	The running status while inverter is controlled by PID and it runs to Min frequency	0：Stopping after delay time 1：Running at Min frequency	0	×
	F508	The sequence of stopping linefrequency	0：First started, first stopped 1：First started, stopped later	0	×
	F509	Min frequency of PID adjusting	F112～F111	15.00	√
	F510	Sleep waiting time after inverter runs to Min frequency by PID adjusting.	0.0～500.0s	15.0	√
	F515	Feedback line disconnection protection	0: Invalid 1: Valid	0	√
	F516	Feedback line disconnection protection value	0.0～100.0%	1.0	√
	F517	Checking time of feedback line disconnection	1.0～10.0	5.0	√
	F518	Whether PID adjusting target is changed	0: Invalid 1: Valid	1	×
	F519	Proportion Gain P	0.00~10.00	0.3	√
	F520	Integration Gain I	0.0~100.0S	0.3	√
	F521	Differential time D	0.00~10.00	0.0	√
	F522	PID sampling cycle	0.1～10.0s	0.1	√
	F523	Reserved			
	F524	Switching Timing unit setting	0: hour 1: minute	0	√

Multi-stage Speed Control	F525	Switching Timing Setting	1～9999	100	×
	F526	Lack Water Protection Mode	0: No protection 1: Protection with sensor 2: Protection without sensor	0	×
	F527	Lack water protection current (%)	10～150%	80	√
	F528	Waking starting interval after protection	0.0～300.0s	0.0	√
	F529	Pressure dead time when starting and stopping linefrequency pumps by PID adjusting	0.0～10.0%	2.0	√
	F530	Running Interval of Frequency-conversion pump after starting linefrequency pumps or interchange time is over	2.0～999.9s	4.0	√
	F531	Delay time of starting linefrequency pumps	0.1～999.9s	3.0	√
	F532	Delay time of stopping linefrequency pumps	0.1～999.9s	3.0	√
	F535	Checking the number of working pumps			×
	F536	Whether No.1 reply is started	0: Stopped 1: Started	0	×
	F537	Whether No.2 reply is started	0: Stopped 1: Started	0	×
	F538	Whether No.3 reply is started	0: Stopped 1: Started	0	×
	F539	Whether No.4 reply is started	0: Stopped 1: Started	0	×
	F540	Whether No.5 reply is started	0: Stopped 1: Started	0	×
	F541	Whether No.6 reply is started	0: Stopped 1: Started	0	×
	F542	Whether No.7 reply is started	0: Stopped 1: Started	0	×
	F543	Whether No.8 reply is started	0: Stopped 1: Started	0	×
	F544	Whether No.9 reply is started	0: Stopped 1: Started	0	×
	F545	Whether No.10 reply is started	0: Stopped 1: Started	0	×
	F546	Whether No.11 reply is started	0: Stopped 1: Started	0	×
	F547	The sequence of starting No 1 relay	1~20	20	×
	F548	The sequence of starting No 2 relay	1~20	20	×
	F549	The sequence of starting No 3 relay	1~20	20	×
	F550	The sequence of starting No 4 relay	1~20	20	×
	F551	The sequence of starting No 5 relay	1~20	20	×
	F552	The sequence of starting No 6 relay	1~20	20	×
	F553	The sequence of starting No 7 relay	1~20	20	×
	F554	The sequence of starting No 8 relay	1~20	20	×
	F555	The sequence of starting No 9 relay	1~20	20	×

Multi-stage Speed Control	F556	The sequence of starting No 10 relay	1~20	20	×
	F557	The sequence of starting No 11 relay	1~20	20	×
	F560	Period of Time Control	0: Null 1: time period control 2: dividing time period control	0	×
	F561	Period of Time Number	1~303	1	×
	F562	Period of Time 1 Starting Hour	0～23	6	×
	F563	Period of Time 1 Starting Minute	0～59	30	×
	F564	Period of Time 1 Stopping Hour	0～23	8	×
	F565	Period of Time 1 Stopping Minute	0～59	30	×
	F566	Period of Time 2 Starting Hour	0～23	9	×
	F567	Period of Time 2 Starting Minute	0～59	30	×
	F568	Period of Time 2 Stopping Hour	0～23	11	×
	F569	Period of Time 2 Stopping Minute	0～59	30	×
	F570	Period of Time 3 Starting Hour	0～23	13	×
	F571	Period of Time 3 Starting Minute	0～59	10	×
	F572	Period of Time 3 Stopping Hour	0～23	14	×
	F573	Period of Time 3 Stopping Minute	0～59	20	×
	F574	Period of Time 4 Starting Hour	0～23	0	×
	F575	Period of Time 4 Starting Minute	0～59	0	×
	F576	Period of Time 4 Stopping Hour	0～23	0	×
	F577	Period of Time 4 Stopping Minute	0～59	0	×
	F578	Period of Time 5 Starting Hour	0～23	0	×
	F579	Period of Time 5 Starting Minute	0～59	0	×
	F580	Period of Time 5 Stopping Hour	0～23	0	×
	F581	Period of Time 5 Stopping Minute	0～59	0	×
	F582	Period of Time 6 Starting Hour	0～23	0	×
	F583	Period of Time 6 Starting Minute	0～59	0	×
	F584	Period of Time 6 Stopping Hour	0～23	0	×
	F585	Period of Time 6 Stopping Minute	0～59	0	×
	F586	Present Minute	0～59	0	×
	F587	Present Hour	0～23	0	×

Function Section	Function Code	Function Definition	Setting Range	Mfr's Value	Change
Auxiliary Functions	F600	DC Braking Function Selection	0: not allowed; 1: braking before starting; 2: braking during stopping; 3: braking during starting and stopping	0	√
	F601	Initial Frequency for DC Braking	1.00～5.00	1.00	√
	F602	DC Braking Voltage before Starting	0～60	10	√
	F603	DC Braking Voltage During Stop	0～60	10	√
	F604	Braking Lasting Time Before Starting	0.0～10.0	0.5	√
	F605	Braking Lasting Time During Stopping	0.0～10.0	0.5	√
	F606	Wait time for Stop and Braking	0～3000.0	1.0	
	F607	Selection of Stalling Adjusting Function	0: invalid; 1: valid	0	√
	F608	Stalling Current Adjusting (%)	120～200	160	√
	F609	Stalling Voltage Adjusting (%)	120～200	140	√
	F610	Stalling Protection Judging Time	0.1～3000.0	5.0	√
	F611-F614	Reserved			
	F615	Daylight saving time conversion	0: Invalid 1: Valid	0	
	F616	Dividing time period conversion month 1	1～12	5	√
	F617	Dividing time period conversion day 1	1～31	1	√
	F618	Dividing time period conversion month 2	1～12	10	√
	F619	Dividing time period conversion day 2	1～31	1	√
	F620	Year	2000～2060	2008	√
	F621	Month	1～12	7	√
	F622	Day	1～31	8	√
	F623	Week	1～7	2	√
	F625	Frequency of 1st time period	0.00～F111	10.00	√
	F626	Frequency of 2nd time period	0.00～F111	20.00	√
	F627	Frequency of 3rd time period	0.00～F111	30.00	√
	F628	Frequency of 4th time period	0.00～F111	40.00	√

	F629	Frequency of 5th time period	0.00～F111	45.00	√
	F630	Frequency of 6th time period	0.00～F111	50.00	√
Function Section	**Function Code**	**Function Definition**	**Setting Range**	**Mfr's Value**	**Change**
Timing Control and Protection	F700	Selection of terminal free stop mode	0: free stop immediately; 1: delayed free stop	0	√
	F701	Delay time for free stop and programmable terminal action	0.0～60.0s	0.0	√
	F702	Fan control mode (only valid for the power 11-710kw)	0:controlled by temperature 1: Do not controlled by temperature	11-22KW：0 30-710KW：1	×
	F703	Setting fan control temperature	0～100℃	45℃	×
	F704	Reserved			
	F705	Overloading Adjusting Gains	0～100	30	×
	F706	Inverter Overloading Coefficient %	120～190	120	×
	F707	Motor Overloading Coefficient %	20～100	100	×
	F708	Record of The Latest Malfunction Type	2: Over-current 3: Over-voltage 4: Input out-phase 5: Inverter over-load 6: Input under-voltage 7: Inverter over-heat 8: Motor over-load 11: External Malfunction 13: ERR2 14: Contactor does not suck		Δ
	F709	Record of Malfunction Type for Last but One			Δ
	F710	Record of Malfunction Type for Last but Two			Δ
	F711	Fault Frequency of The Latest Malfunction			Δ
	F712	Fault Current of The Latest Malfunction			Δ
	F713	Fault PN End Voltage of The Latest Malfunction			Δ
	F714	Fault Frequency of Last Malfunction but One			Δ
	F715	Fault Current of Last Malfunction but One			Δ
	F716	Fault PN End Voltage of Last Malfunction but One			Δ
	F717	Fault Frequency of Last Malfunction but Two			Δ
	F718	Fault Current of Last Malfunction but Two			Δ
	F719	Fault PN End Voltage of Last Malfunction but Two			Δ
	F720	Record of overcurrent protection fault times			Δ

Timing Control and Protection	F721	Record of overvoltage protection fault times			Δ
	F722	Record of overheat protection fault times			Δ
	F723	Record of overload protection fault times			Δ
	F724	Input out-phase	0: invalid; 1: valid	1	×
	F725	Undervoltage	0: invalid; 1: valid	1	×
	F726	Overheat	0: invalid; 1: valid	1	×
	F727	Reserved			
	F728	Input out-phase filtering constant	0.1～60.0	5.0	√
	F729	Undervoltage filtering constant	0.1～60.0	5.0	√
	F730	Overheat protection filtering constant	0.1～60.0	5.0	√
	F731	Output Out-phase1			×
	F732	Output Out-phase 2			×
	F733	Output Out-phase 3			×
	F734～F740	Reserved			
Parameters of the Motor	F800	Reserved			
	F801	Rated power	0.2～1000KW		×
	F802	Rated voltage	1～440V		×
	F803	Rated current	0.1～6553A		×
	F804	Number of motor poles	2～100	4	×
	F806～F809	Reserved			
	F810	Motor rated frequency	1.0～300.0Hz	50.00	
	F811～F830	Reserved			
Function Section	**Function Code**	**Function Definition**	**Setting Range**	**Mfr's Value**	**Change**
Communication parameters	F900	Communication Address	1~247: single inverter address 0: broadcast address	1	√
	F901	Communication Mode	1：ASII；2：RTU	1	√
	F902	Reserved			
	F903	Odd/Even Calibration	0: no calibration 1: odd calibration 2: even calibration		
	F904	Baud Rate	0：1200；1：2400； 2：4800； 3：9600； 4：19200 5: 38400 6: 57600	3	√
	F905～F930	Reserved			

Note: × indicating that function code can only be modified in stop state.
√ indicating that function code can be modified both in stop and run state.
Δ indicating that function code can only be checked in stop or run state but cannot be modified.
○ indicating that function code cannot be initialized as inverter restores manufacturer's value but can only be modified manually.
* indicating that function code can be changed by manufacture.

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